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Crashworthiness Protection Requirements for Tank Cars; Detection and Repair of Cracks, Pits, Corrosion, Lining Flaws, Thermal Protection Flaws and Other Defects of Tank Car Tanks; Final Rule

DEPARTMENT OF TRANSPORTATION

Research and Special Programs Administration

49 CFR Parts 171, 172, 173, 179, and 180

[Docket Nos. HM–175A and HM–201; Amdt Nos. 171–137, 172–144, 173–245, 179–50, and 180–8]

RIN 2137–AB89 and 2137–AB40

Crashworthiness Protection Requirements for Tank Cars; Detection and Repair of Cracks, Pits, Corrosion, Lining Flaws, Thermal Protection Flaws and Other Defects of Tank Car Tanks

AGENCY: Research and Special Programs Administration (RSPA), DOT.

ACTION: Final rule.

SUMMARY: RSPA is amending the Hazardous Materials Regulations (HMR) to: Require facilities that build, repair, and ensure the structural integrity of tank cars, to develop and implement a quality assurance program (QAP); allow the use of non-destructive testing (NDT) techniques, in lieu of currently prescribed periodic hydrostatic pressure tests, for fusion welded tank cars; require thickness measurements of tank cars; allow the continued use of tank cars, with limited reduced shell thicknesses, for certain hazardous materials; increase the frequency for inspection and testing of tank cars for added safety; clarify tank car pretrip inspection requirements; expand the use of thermal protection systems and head protection on tank cars to include certain other high hazard materials; add new requirements for bottom-discontinuity protection; require the use of protective coatings on insulated tank cars; prohibit the use of self-energized manways located below the liquid level of the tank; remove ''grandfather'' provisions allowing certain uses of tank cars; and improve the puncture resistance of tank cars used for certain high hazard materials, including those that are poisonous-by-inhalation (PIH) and those determined by the Environmental Protection Agency (EPA) to pose health and environmental risks.

These actions are being taken to enhance the safe transportation of hazardous materials in tank cars. The intended effects of these actions are to improve the crashworthiness of tank cars and to increase the probability of detecting critical tank car defects.

DATES: *Effective date.* The effective date of these amendments is July 1, 1996.

Compliance date. Voluntary compliance with the regulations, as amended herein, is authorized November 1, 1995.

Incorporation by reference date. The incorporation by reference of certain publications listed in these amendments is approved by the Director of the Federal Register as of July 1, 1996.

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SUPPLEMENTARY INFORMATION:

I. Introduction

This final rule consolidates two related notices of proposed rulemaking published under Docket HM–175A [58 FR 52574, October 8, 1993] and Docket No. HM–201 [58 FR 48485 September 16, 1993], that address the safe performance of tank cars used to transport hazardous materials. RSPA believes that, by consolidating these two rulemakings, changes to sections that are affected by both rules will be more easily understood by readers. This preamble discusses separately, for each rulemaking, the notices of rulemaking and comments received in response to these notices. A consolidated ''Review by Section Summary'' summarizes the changes made under this final rule.

The Federal Railroad Administration (FRA) has enforcement authority for tank cars and rail transportation. FRA developed these rulemakings jointly with RSPA.

II. Docket HM–175A—Crashworthiness Protection Requirements for Tank Cars

A. Background

Based on research and on the FRA's continuing review of serious accidents, involving the transportation of hazardous materials in tank cars in the United States and Canada, RSPA issued a number of regulations to improve the survivability of tank cars in accidents.[1] In these rulemakings, RSPA required the installation of a tank-head puncture-resistance system (head protection), a coupler vertical restraint system (shelf couplers), insulation, and a thermal protection system for certain high-risk hazardous material ladings. The difference between a ''thermal protection system'' and ''insulation'' is that a ''thermal protection system'' protects a tank from a pool or torch-fire environment. In contrast, ''insulation'' protects the lading inside the tank from ambient, temperature differentials, much like home insulation. The record shows that these systems, working in combination, have greatly reduced the potential harm to human health and the environment when tank cars are involved in accidents.

On October 8, 1993, RSPA published a notice of proposed rulemaking (NPRM) under Docket HM–175A (58 FR 52574) based, in part, on recommendations issued by the National Transportation Safety Board (NTSB) and comments received in response to an advance notice of proposal rulemaking published on May 15, 1990 [55 FR 20242], and a supplemental advance notice of proposed rulemaking published on August 29, 1990 [55 FR 35327]. The NPRM solicited comments on the costs and safety benefits that would be derived should the HMR be amended in the following areas: (1) Tank-head protection; (2) thermal protection; (3) self-energized manways below the tank liquid level; (4) non-pressure tank cars for PIH materials; (5) grandfather provisions allowing use of certain tank cars conforming to former standards; (6) bottom discontinuity protection on tank cars; (7) protective coatings on insulated tanks; and (8) tank cars of limited and designated specifications, with greater protection in accidents for transporting materials determined by EPA to pose health and environmental risks.

On January 6, 1994, FRA and RSPA held a public hearing to solicit information to assist in deciding what actions, if any, should be taken to improve the survivability of tank cars involved in hazardous materials accidents. Twelve persons made presentations at the public hearing. In addition, RSPA received 37 written comments in response to the NPRM from representatives of trade associations and the various industries that own, lease, transport, or use tank

[1] The discussions in the following rulemakings provide greater detail about each of these safety system requirements: *Interlocking Couplers and Restrictions of Capacity of Tank Cars,* Docket HM–38, 35 FR 14215 (September 9, 1970); *Tank Car Tank Head Protection,* Docket HM–109, 41 FR 21475 (May 26, 1976); *Shippers; Specifications for Pressure Tank Cars,* Docket HM–144, 42 FR 46306 (September 15, 1977); *Shippers, Specifications for Tank Cars,* Docket HM–174, 49 FR 3473, (January 27, 1984); *Specifications for Railroad Tank Cars Used to Transport Hazardous Materials,* Docket HM–175, 49 FR 3468 (January 27, 1984); *Transportation of Hazardous Materials, Miscellaneous Amendments,* Docket HM–166W, 54 FR 38790 (September 20, 1989); and *Performance-Oriented Packaging; Changes to Classification, Hazard Communication, Packaging and Handling Requirements Based on UN Standards and Agency Initiative,* Docket HM–181, 55 FR 52402 (December 21, 1990).

cars. All written and oral comments were given full consideration.

B. Tank Cars Transporting ''Thermally Reactive Materials'' (Materials That May Violently Decompose or Polymerize When Exposed to Fire)

In the NPRM, RSPA proposed to require the use of full-head protection and thermal protection on tank cars used for certain materials termed, ''thermally reactive.'' These materials, listed by name, are thought by many to be capable of a violent decomposition or polymerization reaction when exposed to fire. For these materials, the critical temperature for the tank car, and its thermally reactive lading, may be the heat at which the material undergoes decomposition or polymerization—as opposed to the temperature at which the steel of the tank becomes so plastic, it begins to lose tensile strength.

The proposal was based on several accidents involving thermally reactive materials. For example, on August 2, 1988, at 9:00 p.m., in Brazoria, Texas, 13 cars of a Union Pacific freight train derailed.[2] Seven of the derailed tank cars contained acetaldehyde, and none of these tank cars had a thermal protection system, which was not required. Two acetaldehyde tank cars sustained coupler punctures and released their contents, which ignited. The resulting fire engulfed four other acetaldehyde tank cars, and each of them had a total failure or rupture of the tank shell within 5 to 10 minutes after the derailment. Witnesses reported 3–4 explosions between 9:05 p.m. and 9:10 p.m.

In another accident, NTSB found that the puncture of a tank car containing hydrogen peroxide resulted in a release of lading and, when the hydrogen peroxide combined with contaminants on the ground, a chemical reaction occurred causing a fire.[3] The fire heated and ignited nearby polyethylene pellets, causing an explosion of the hydrogen peroxide tank car and releasing a force equivalent to an explosion of 10 tons of TNT (trinitrotoluene).

Most commenters opposed the requirement for full-head protection or thermal protection on tank cars used for thermally reactive materials. In clarifying its comments on the NPRM, the Association of American Railroads (AAR) stated that full-head protection is not necessary for tank cars used for these materials, unless the materials pose another hazard that warrants such protection. Other commenters, such as American Petroleum Institute (API), Chemical Manufacturers Association (CMA), and the Compressed Gas Association, Inc. (CGA), suggested that RSPA open a new ANPRM to address these materials. A commenter stated—

> the creation of this category has ramifications that reach far beyond this particular rulemaking, which deals with one mode of transportation (rail) and one type of packaging (tank cars). We are concerned with the likelihood that, in the future, the Department will expand the regulation of TRMs to affect other modes of transportation and types of packaging.

Other commenters objected to the proposal to identify by list, rather than by definition, certain existing hazardous materials that would be designated ''thermally reactive.'' CMA challenged the placement of several chemicals on the list, such as ''styrene, monomer inhibited,'' ''vinyl toluene,'' ''vinylidene chloride,'' ''sulfur trioxide,'' and ''hydrogen peroxide.'' CMA further stated that—

> [s]tyrene, for example, is flammable and can polymerize in an accident but solidifies causing little or no harm to the environment. For hydrogen peroxide tank cars, the proposed rule would create a safety hazard by requiring thermal protection.

Another commenter stated that ''[s]ome of the materials on the list react violently when exposed to heat differentials and may decompose with explosive force * * * Other materials, however, decompose through polymerization into substances of relatively little hazard.'' The commenter further explained that the key to the polymerization of styrene is the absence of the inhibitor. Styrene is typically shipped with inhibitor concentrations great enough to cover fairly lengthy, unexpected delays in transportation. If a tank car of styrene is exposed to extreme external heat, disregarding its flammable nature, the inhibitor will dissipate rapidly as the temperature of the material rises above 125 °F., which will allow the polymerization process to begin. As a result of the polymerization, the internal heat of the product will increase, and, with increasing temperature, the process will accelerate.

Several commenters opposed the requirement for a thermal protection system on tank cars used to transport ''hydrogen peroxide.'' One of the commenters stated that hydrogen peroxide does not polymerize or burn, and the products of decomposition—water and oxygen—are not toxic.

Two commenters, Eka Nobel and FMC Corporation (FMC), furnished independent analyses of the fire effects on tank cars containing ''hydrogen peroxide.'' Eka Nobel contracted with the IIT Research Institute (IITRI), which used FRA's computer model to analyze the fire effects on a tank car containing hydrogen peroxide.[4] The results of IITRI's analysis indicate that a tank car constructed from stainless steel will meet the thermal protection criterion for withstanding the effects of a pool fire.

FMC furnished a detailed, mathematical heat transfer model using a correlation contained in a National Fire Protection Association (NFPA) publication, ''NFPA Pamphlet No. 30.'' FMC stated that for materials that decompose exothermically, such as hydrogen peroxide, thermal stability requires that the heat losses to the surroundings balance the heat generated by the decomposition. Failure to remove the heat of reaction could lead to runaway decomposition, and if the increased pressure exceeds the burst pressure of the tank, the tank will fail. Furthermore, heat input causes oxygen generation from thermal decomposition of peroxide and vapor generation, by boiling off the water-peroxide mixture. FMC further stated that because water is more volatile than peroxide, the hydrogen peroxide concentration in the tank will increase (although this may be compensated by water formation and peroxide loss from thermal decomposition). If the peroxide concentration reaches 74 percent by weight, the vapors in equilibrium with the liquid (40 percent by weight of peroxide) can detonate, if ignited, causing the tank car to fail.

The results of FMC's mathematical heat transfer model show that tank cars containing hydrogen peroxide (having no less than a 7-percent outage) will not fail and such tank cars will meet the thermal protection criterion in § 179.18 of this final rule for withstanding the effects of a pool-fire. Readers who are interested in a detailed discussion of Eka Nobel or FMC's fire studies on tank cars containing hydrogen peroxide, should refer to the comments filed in the RSPA Dockets Unit.

Many commenters suggested a performance-based definition as a means to ensure the proper identification and packaging of thermally reactive materials, because, with increasing temperature, all materials will reach a stability limit.

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[2] *Union Pacific Derailment at Brazoria, Texas,* FRA Accident Investigation No. 137–88, Railroad Report No. 0888H0200, August 2, 1988.

[3] *Collision and Derailment of Montana Rail Link Freight Train with Locomotive Units and Hazardous Materials Release, Helena, Montana, February 2, 1989,* National Transportation Safety Board Report NTSB/RAR–89/05, National Transportation Safety Board, Washington, D.C.

[4] ''*Temperatures, Pressures and Liquid Levels of Tank Cars Engulfed in Fires,*'' NTIS DOT/FRA/OR&D–84/08.11, (1984), Federal Railroad Administration, Washington, DC.

These commenters suggested a performance-based definition that would include the polymerization potential; the rate of the chemical reaction (reaction kinetics); any highly exothermic reaction; the formation of gases, vapors, or fumes in a quantity sufficient to present a danger to human health and the environment; and any reactive by-products that could lead to over-pressurization of the tank. Commenters stated that a performance-based definition was the best way to ensure that the proper packaging requirements are attached to the appropriate hazardous materials.

As evidenced from the comments, there is no single agreement on the best approach to identify these materials, nor to ensure the proper packaging requirements are assigned to these materials. Because of the multiplicity of these yet unresolved issues, the packaging requirements proposed in the NPRM for thermally reactive materials have not been adopted in this final rule.

C. Tank-Head Protection

In the NPRM, RSPA proposed several changes relating to tank-head protection. The proposal would require tank-head protection on tank cars, used for all Class 2 materials and for tank cars constructed from aluminum or nickel plate, when used to transport a hazardous material. RSPA included Division 2.2 in its proposal to reduce the violent rupture hazard and the asphyxiation potential to railroad workers or bystanders exposed to the product if these tank cars are punctured. The proposal to require full-head protection for tank cars constructed from aluminum or nickel plate is based on the vulnerability of the tank head to a puncture. The top-half of the tank head is vulnerable to puncture in a derailment. Existing tank cars with half-head protection were excluded, based on RSPA and FRA's regulatory analysis discussed later in this preamble. Consistent with these proposed changes, RSPA also proposed to eliminate a grandfather provision, in place since 1984, following publication of a final rule under Docket HM–175, that permits certain tank cars, with a capacity of less than 70 kiloliters (kl; 18,500 gallons), to continue in service without head protection.

RSPA first introduced tank-head protection requirements after a series of railroad accidents in the late 1960s and early 1970s involving head punctures of tank cars (39 FR 27572 and 41 FR 21475). The requirements of, and criteria for, head protection were based on tests performed by FRA, the AAR, and the Railway Progress Institute (RPI) Tank Car Safety Research and Test Project in the early 1970s. In summary, these tests showed that head punctures, caused by over-speed impacts in railroad classification yards, generally occurred at speeds above 12 mph and often happened when a loaded tank car struck a standing empty tank car, causing the empty car to ''jump'' and ram its coupler into the head of the oncoming tank. A recent informal staff analysis of data on main-line accidents showed that objects, such as broken rails and couplers, may penetrate the top half of the tank head, indicating that head protection is essential, even though not 100 percent effective, in a train derailment.

The NPRM referenced the recent FRA research on puncture resistance, which shows that puncture resistance is strongly influenced by impact location, head and jacket thickness, and insulation thickness.[5] Stated differently, research demonstrates that puncture resistance is an inter-related function of head thickness, insulation thickness, and jacket thickness, and that the concept of ''head protection'' must include more than just traditional ''head shields.'' Based on the results of this research, FRA expects that certain tank cars may meet the 29 kilometers per hour (18-mph) threshold for puncture-resistance, prescribed in § 179.16 of this final rule, without further modification.

Tank cars currently equipped with half-head protection. Most commenters agreed that there is no need to require full-head protection on existing tank cars having only half-head protection.

In comments filed in this docket, NTSB stated that the NPRM addressed many of their concerns, but noted the proposal failed to require existing tank cars used to transport Division 2.1 (flammable gas) materials, or other materials with extreme hazards, to be modified with full-head protection. Thus, these materials could be transported indefinitely in tank cars without full-head protection modifications.

While we appreciate the concerns of NTSB, we are not able to establish a positive benefit/cost ratio by requiring modification of the existing tank car fleet, primarily because the half-head protection on existing cars is already about 95-percent effective. It is not credible to argue that greater safety gains are realized by mandating safety improvements on tank cars that currently have a 95-percent effective protection system, than by requiring improvements on tank cars without a head-protection system. The regulatory evaluation considered both approaches, with emphasis being placed on choosing the alternative offering maximum potential benefit to society, while imposing the least net cost. Based on the regulatory evaluation, this final rule does not require that existing half-head protection be removed and replaced with full-head protection.

Head protection systems for existing tank cars with capacities less than 70 kl (18,500 gallons). RSPA received diverse comments in response to this proposal in the NPRM. One commenter agreed that class DOT 105 tank cars having capacities less than 70 kl (18,500 gallons) and transporting Division 2.1, 2.2, and 2.3 materials, should have full-head protection, unless already equipped with half-head protection.

CMA supported the proposal to require full-head protection on newly built class DOT 105A tank cars, regardless of tank capacity, when used to transport a Division 2.1 or 2.3 material. The Reebie Associates report, submitted as part of CMA's comments, assumed that all tank cars would require head protection, except those that have a tank test pressure of 41.4 Bar (600 pounds per square inch [psi]).

The Chlorine Institute agreed that head protection systems are now warranted for the transportation of chlorine, but recognized, based on FRA research and the accident history, that many tank cars currently used to transport chlorine meet the performance standard by virtue of a thick tank-head and a tank jacket.

NTSB commented that RSPA should require tank-head protection, within 5 years, for all class 105 tank cars having capacities of less than 70 kl (18,500 gallons) when used to transport a Division 2.1 (flammable gas) material as proposed in Option B of the NPRM.

RPI commented that, except for the nominal 41 kl (11,000-gallon) capacity tank cars, existing tank cars of less than 70 kl (18,500-gallon) capacity, transporting Division 2.1 materials or anhydrous ammonia, should have head-protection, but only half-head protection. RPI further commented that RSPA should exclude tank cars having a nominal capacity of 41 kl (11,000 gallons) from any head protection modification program, because most tank cars in this category are near or exceed 30 years of age; consequently, the economic life of the tank is nearing an end.

RSPA and FRA believe that there is no longer a justification for excluding tank cars having a capacity less than 70

[5] Coltman, M., & Hazel, M., Jr., *Chlorine Tank Car Puncture Resistance Evaluation* (1992), Federal Railroad Administration, Washington, DC (NTIS DOT/FRA/ORD–92/11).

kl (18,500 gallons) from the modification requirements. While CMA's report is not so optimistic on the use of DOT 105A500W specification tank cars, RSPA and FRA believe that most of these tank cars will meet the performance standard by virtue of their increased head thickness, insulation, and metal jacket. Because of the small number of tank cars in this category, and the small incremental cost to make such head protection modifications for those tank cars that do not otherwise meet the performance standard mandated by this rule, in this final rule RSPA is removing the 70 kl (18,500-gallon) exception for existing tank cars in current §§ 173.314(c) and 173.323(c)(1).

Further, while most commenters supported the 10-year modification program for existing tank cars, we agree with NTSB, that when these tank cars are used to transport Division 2.1 materials, a 5-year modification program (as proposed in Option B of the NPRM) will ensure that those cars presenting the greatest risk are modified first.

Tank cars transporting materials in Division 2.2. A commenter stated that the proposal to require full-head protection for Division 2.2 gases is sound and should be finalized. Several other commenters disagreed with the proposal to require full-head protection for Division 2.2 materials. The Reebie Associates report, submitted by CMA, identified 467 Class 2 materials affected by the proposed rule, 11 of which are Division 2.2 materials. The report shows that shippers used 1,448 tank cars in 1992 to transport these Division 2.2 materials, as follows:

Commodity	Population
Argon, refrigerated liquid	2
Ammonia solutions	28
Bromotrifluoromethane	1
Carbon dioxide, refrigerated liquid	1,016
Chlorodifluoromethane	145
Chlorotetrafluoroethane	26
Chloropentafluoroethane	37
Dichlorotetrafluoroethane	164
Fertilizer, ammoniating solutions	4
Trifluoromethane	1
Xenon, refrigerated liquid	24
Total	1,448

CGA opposed the full-head protection requirement for tank cars transporting carbon dioxide. CGA referenced the testimony presented by RPI at the January 6, 1994 public hearing concerning recent head impact tests that verified the adequacy of the current head protection system on DOT 105A500W specification tank cars.

With regard to CMA's and CGA's comments, RSPA and FRA believe that most tank cars used for ''carbon dioxide, refrigerated liquid,'' meet the performance standard for head protection by virtue of their tank head thickness and metal jacket. Tank cars used for ''argon, refrigerated liquid,'' and ''xenon, refrigerated liquid,'' also meet the head performance standard by virtue of the authorized class DOT 113 tank car specification. These tank cars must have a minimum outer jacket tank head of not less than ½-inch thick steel. See § 179.400–8(d). A total of 1,042 tank cars, or 72 percent of the total Division 2.2 tank car population, are used to transport these three commodities.

A commenter opposed tank-head protection for Division 2.2 materials stating, ''heavy walled tank and protective housing for the fittings is adequate for the transportation environment.'' The commenter also provided an in-house report using a computer model that claims the asphyxiation potential from a punctured Division 2.2 refrigerant gas tank car to be very low.'' Another commenter opposed applying head protection to tank cars transporting Division 2.2 refrigerant gases. This commenter stated that, in the past, DOT had judged a material based on its hazards under normal conditions of transport, and that in this rulemaking, DOT was over-assessing the potential for harm in a low-probability event. RPI supported full-head protection on new, insulated tank cars transporting Class 2 materials, but it opposed full-head protection for new non-insulated tank cars or for existing tank cars transporting these materials.

We believe that even though the probability of an event occurring with these materials is low, safety concerns still need to be addressed, because the event may lead to high consequences, such as a large scale evacuation or an oxygen deficient atmosphere in a concentrated populated area. Taking the safety steps adopted in this final rule will mitigate these hazards.

We also believe that the transportation risks associated with Division 2.2 gases are sufficient to require full-head protection for new tank cars, and for existing tank cars without head protection, when used to transport Division 2.2 materials. As noted above, this rule does not require existing tank cars equipped with half-head protection to be modified with full-head protection. RSPA and FRA are aware of industry concerns that the attachment of full-head protection to non-jacketed cars is a feature not yet proven by long service. Similar arguments were raised when head protection was first required almost two decades ago [HM–144; 42 FR 46306, September 15, 1977]. FRA is aware of companies with plans to attach full-head protection to their non-jacketed tank cars. As discussed later in this preamble, a phased-in 10-year modification program is provided for existing tank cars.

Existing tank cars without head protection. Most commenters to the NPRM supported the need to modify existing tank cars to meet the current safety requirements. One commenter supported the need to modify existing tank cars constructed from aluminum plate with half-head protection, but believed full-head protection should be required when a proven full-head shield design is available. Another commenter suggested that DOT should specifically recognize that tank cars used in ''chlorine'' service meet the performance requirements for head protection and that DOT should not require any additional head protection for these tank cars.

As stated in the NPRM, the benefits of head protection are real, predictable, and quantifiable. RSPA disagrees with commenters who state that full-head protection is not warranted. Where earlier rules required head protection on tank cars, it was a matter of recognizing the highest priority needs first. The question is not one of demanding low-priority, safety benefits, but the need to expand the safety base of hazardous materials transportation in tank cars. Further, the small additional cost of installing full-head protection on cars that now have no head protection system, as compared with adding only half-head protection, is justified on the basis of increased safety (see Chapter V of the Economic Impact Assessment and Regulatory Flexibility Analysis). In this final rule, RSPA requires existing tank cars that currently have no head protection, to have full-head protection installed when used to transport a Class 2 material. As explained below, RSPA is also requiring full-head protection for tank cars constructed from aluminum or nickel plate when used to transport hazardous material.

Tank cars constructed from aluminum and from nickel plate. Commenters supported the need for head protection on tank cars constructed from aluminum or nickel plate, but not the full-head protection requirement proposed in the NPRM. Most commenters stated that there is no design available for the securement of full-head protection on tank cars without metal jackets.

One commenter stated that his company's new aluminum tank cars, constructed with greater tank shell and head dimensions than standard tank cars, offer greater protection without head protection. The commenter stated that further testing should be done and suggested that RSPA and FRA submit more evidence to support the need for this requirement.

CMA supported requiring half-head protection for new tank cars constructed from aluminum or nickel plate, and requiring half-head protection for existing tank cars for certain hazardous materials. Several commenters requested that RSPA consider the characteristics of an individual Division 2.2 material, and that materials not subject to the HMR, and low hazard materials should be excluded.

We realize that the use of good engineering practice and design specifications are needed to secure full-head protection to tank cars without metal jackets. Although there is no service experience for a full-head protection design on non-insulated tank cars, such designs are certainly not unreachable within the years ahead. In rulemaking proceedings under another docket [HM–144; 42 FR 46306, September 15, 1977] introducing half-head protection, commenters offered similar arguments regarding head protection, for which solutions were later found as a result of technological innovation. Currently, FRA is aware of several companies that are nearing completion on their full-head protection designs for aluminum and nickel tank cars. We, therefore, believe that the introduction of this requirement will not adversely affect industry. In this final rule, the use of full-head protection for all tank cars constructed from aluminum or nickel plate is required when used to transport a hazardous material. As discussed later in this preamble, RSPA has provided for a phased-in 10-year modification program.

D. Thermal Protection Systems

In the NPRM, RSPA proposed to require a thermal protection system for a Class 2 material when a thermal analysis of the tank car and lading shows that a release will occur other than through the safety relief valve when the tank car is subjected to either a 100-minute pool fire or a 30-minute torch fire. The current HMR require thermal protection for Division 2.1 (flammable gas) materials (with limited car capacity restrictions) and certain Division 2.3 (poison gas) materials. RSPA proposed to expand the thermal protection requirements to include Division 2.2 materials because, as stated by AAR, ''[a]t a chemical accident, there are generally two reasons for an evacuation, one is to protect the public from any toxic, poisonous, or noxious vapors or fumes generated by the product itself . . ., the second is to protect the public from thermal ruptures and the container debris that may be hurled from an incident site'' [*Emergency Action Guides,* p. VII]. RSPA also proposed to expand the thermal protection requirement to include all Division 2.3 materials.

RSPA began to require the application of a thermal protection system on tank cars transporting Division 2.1 materials (flammable gases) or ''ethylene oxide'' (Division 2.3) after a series of major railroad accidents involving fires and ruptures of non-insulated pressure tank cars. The design of and criteria for thermal protection systems were based on tests performed by FRA at the U.S. Army Ballistics Research Laboratory in White Sands, New Mexico, and at the Transportation Test Center in Pueblo, Colorado. These tests revealed that a 127.2 kl (33,600 gallon) non-protected tank car filled with propane (Division 2.1) will rupture, with 40 percent of the lading remaining in the tank car, within 24 minutes after exposure to a pool-fire. Rupture occurs when the residual strength of the tank shell falls below the force generated by the vapor pressure of the lading exerted on the inside surface of the tank shell. Further testing by FRA demonstrated that a tank car filled with propane and equipped with a thermal protection system delayed the thermal rupture of the tank car for 94.5 minutes, by maintaining the shell temperature low enough to vent 98 percent of the lading through the safety relief valve. The current performance standard, requiring exposure to a 100-minute pool fire and a 30-minute torch fire, was chosen because it provides emergency response personnel time to assess the accident and to initiate remedial actions, such as evacuating an area.

Division 2.1 (flammable gas) and 2.3 (poisonous gas) materials: Several commenters supported the need for a thermal protection system on tank cars transporting Division 2.1 or 2.3 materials, regardless of tank car capacity. The AAR and another commenter supported a thermal protection system for all Class 2 materials, unless a shipper could show that a release will not occur, other than through the safety relief valve, when the tank and lading are subject to a fire. RPI also concurred on the need for thermal protection for all Class 2 materials, but, except for Division 2.1, but did not support the high-temperature performance standard proposed in § 179.18. RPI stated that most insulation materials (e.g., 4 inches of glass-fiber insulation) are adequate.

In this regard, RSPA stated in the NPRM that many insulation materials also provide good thermal protection. These insulation materials, when analyzed with the tank and the lading, may show that nothing further needs to be installed on the tank car to achieve passage of the pool- and torch-fire performance tests. Research sponsored by FRA on urethane-foam and glass-fiber insulation systems show that urethane-foam insulation will pass the pool- and torch-fire requirements and that glass-fiber insulation will also pass both tests, provided the insulation is held in place with a plastic or wire scrim. Owners of tank cars with either of these systems, or another comparable system, may find that their thermal analysis of the tank car shows the presence of sufficient thermal protection to meet the performance standard. In this case, the tank car owner would have to verify only that the insulation material installed on the tank car is capable of passing the pool- and torch-fire verification or ''proof'' tests in Appendix B to Part 179 of this final rule. Owners may find that a tank car will pass the performance standard with only minor modifications, such as applying a thermal protection system to the manway nozzle.

Also in the NPRM, RSPA stated that, in 1981, a joint effort between the Chlorine Institute and RPI-AAR Tank Car Safety Research and Test Project resulted in the development of an insulation system to protect a chlorine tank car involved in a fire. The insulation system developed maintains back plate (inside surface of the tank car shell) temperatures below 250.56 °C (483 °F). After reviewing the thermal resistance capabilities of the insulation system used on chlorine tank cars, RSPA incorporated it into the HMR in 1987. Readers should refer for more information to Docket HM–166U, entitled ''*Transportation of Hazardous Materials; Miscellaneous Amendments*'', 52 FR 13034, (April 20, 1987).

Division 2.2 (nonflammable gas) materials. As noted earlier in the preamble discussion on tank-head protection for Division 2.2 materials, CMA commented that there were 1,448 tank cars allocated to Division 2.2 materials that had not already been captured in another service, such as PIH. Of those, ''argon, refrigerated liquid,'' ''carbon dioxide, refrigerated liquid,'' and ''xenon, refrigerated liquid,'' represent 1,042 tank cars, or 72 percent. CMA further commented that

almost 100 percent of the total would need retrofitting and that the overall economic impact of the new regulations on this group of tank cars amounts to $26.0 million for retrofitting and $2.59 million for higher lease rates and additional cars in the tenth year of the implementation period.

With regard to the issues raised by CMA, this final rule does not contain any new thermal protection requirements for ''argon, refrigerated liquid,'' ''carbon dioxide, refrigerated liquid,'' or ''xenon, refrigerated liquid.'' Carbon dioxide is transported in DOT 105A500W tank cars equipped with two regulator valves, a reclosing pressure-relief device, a frangible disc, and an insulation system with good thermal performance (a thermal conductance of 0.03 British Thermal Units [B.t.u.] per square foot per degree Fahrenheit differential). Consequently, existing and new tank cars in carbon dioxide service have sufficient thermal resistance when exposed to fire. Likewise, because with argon and xenon, refrigerated liquids are packaged under the exceptions for atmospheric gases in § 173.320, this final rule does not impose any new thermal protection requirements. This section exempts cryogenic atmospheric gases from the packaging requirements when the packagings are designed to maintain pressures below 1.74 Bar (25.3 psi) under ambient temperature conditions.

Another commenter opposed the use of thermal protection for Division 2.2 materials on the basis that the hazards they pose do not equate to those of Division 2.1 and 2.3 materials. The commenter further stated that the thermal protection requirements proposed for Division 2.2 materials do not appear to be justified by the hazards posed, because, in many cases, these materials dissipate naturally with little risk to the surroundings.

A commenter, primarily addressing refrigerant gases, noted that an analysis of each Division 2.2 material, to predict the behavior of a tank car in a 100-minute pool-fire, seemed an unnecessary precaution because the calculations, required by the current regulations, for sizing safety relief valves accomplish the same purpose and meet this same standard. RSPA and FRA disagree with this commenter's position that the current regulations for sizing safety relief valves accomplish the same purpose as the proposed Division 2.2 thermal protection performance standard. The current safety relief valve-sizing requirements make several assumptions. First, the valve sizing formula assumes the exposure factor, that portion of the tank car exposed to fire (represented as $A^{0.82}$), is about one-fourth of the tank. The pool-fire computer model in this final rule assumes total engulfment. Second, the safety relief valve sizing formula assumes that flame temperatures will reach approximately 650 °C (1,200 °F.). The pool-fire standard assumes flame temperatures will reach 871 °C (1,600 °F) for a pool-fire and 1,204 °C (2,200 °F) for a torch fire at 40 miles per hour.[6] Third, the safety relief valve-sizing formula does not take into consideration either an overturned tank car venting liquid or a liquid-gas mixture (two phase flow) or the diminished burst strength of the heated tank shell in the non-wetted area, after prolonged fire exposure.

The Fertilizer Institute did not support the requirement for thermal protection on tank cars transporting ''anhydrous ammonia''. It stated that the likelihood of a fire-induced rupture of a tank car carrying anhydrous ammonia has significantly decreased since 1980 because of added safety devices, safer placement in trains, and improved emergency response procedures. Thus, there is little, if any, increase to public safety by imposition of the proposed thermal protection requirements on these tank cars.

While RSPA and FRA agree with The Fertilizer Institute that the safety record for tank cars transporting ''anhydrous ammonia'' is good, these cars have a potential for violent rupture similar to compressed gas tank cars, which received thermal protection many years ago. As The Fertilizer Institute notes, the threat of a fire-induced violent rupture of an anhydrous ammonia tank car is more than just a theoretical potential. Since 1990, according to figures from the AAR, ''anhydrous ammonia'' has been the sixth highest volume hazardous material transported by railroad.

AAR and two other commenters supported the need for thermal protection for Class 2 materials, including Division 2.2. One of these commenters stated: ''thermal protection systems are a good, simple idea whose time has come. The purpose of the system is to prevent rupture of the tank car in a fire with the release of its hazardous materials contents to the environment. Uncontrolled release of almost any hazardous material to the environment is objectionable whether due to toxicity, flammability, or simply clean-up costs.'' This commenter further stated that there can be little basis for exempting anhydrous ammonia from the thermal protection requirements simply because it is not likely to catch fire once released. Its PIH characteristic remains, and the potential for rupturing in a non-insulated tank car is high.

Although not all commenters agree on the need for thermal protection for Division 2.2 materials, in this final rule RSPA requires such a system if, after an analysis of the effects of a 100-minute pool fire and a 30-minute torch fire, there will be a release of the tank car lading other than through the safety relief valve. Because tank cars may transport different ladings, and because changing ladings may affect the whole system, owners or shippers may choose to perform a ''worst case'' analysis based on all the commodities the car is likely to carry.[7]

Based on these comments and FRA's research, this final rule requires the owner or the shipper of a Class 2 material, with the exception of ''carbon dioxide, refrigerated liquid,'' ''chlorine,'' and ''nitrous oxide, refrigerated liquid'' as explained above, to perform an analysis of the characteristics of the material and of the thermal resistance capabilities of the tank car, taking into consideration the safety relief valve start-to-discharge pressure setting and relief capacity and all areas of the tank car that are not afforded protection from fire (such as stub sills, bolsters, and protective housings).

Tank cars constructed from aluminum and nickel plate. Most commenters said that the lading within a tank car constructed from aluminum or nickel plate should determine the need for a thermal protection system.

We agree. The NPRM proposed to require a thermal protection analysis for aluminum and nickel plate cars carrying Class 2 materials. Based on the comments received, we believe that all such tank cars will need protection and that such protection is essential.

This final rule requires the owner of an aluminum or nickel plate tank car used to transport a Class 2 material to perform an analysis of the tank car in a 100-minute pool fire and in a 30-minute torch fire using FRA's Tank Car Fire model. If the analysis shows that a release of the lading from the tank car,

[6] The pool-fire computer model assumes an average heat flux over the entire tank surface, equivalent to complete engulfment in a fire, where the flame temperature is 815.5 °C (1,500 °F). If a higher or lower flame temperature were assumed, the parametric analyses in the computer model would not match the actual field test data.

[7] Owners are reminded that 49 CFR 173.31(a)(4) limits the use of tank cars to those commodities for which they are authorized. Authorized (or approved) commodities are those listed on the certificate of construction or an AAR R–1 form. (*See* the AAR Specifications for Tank Cars Section 1.4.3.1 and Appendix R, Section R4.04.)

will occur, other than through the safety relief valve, a thermal protection system will be required. This final rule adopts a 10-year phase-in period for those existing tank cars required to have thermal protection.

E. Shell Protection

For tank cars transporting of a material poisonous by inhalation (PIH), RSPA proposed that they have ''shell protection conforming to § 179.100–4.'' That is, the optional use of an insulated DOT 105S tank car or a non-insulated, but thermally protected, DOT 112J or 114J tank car having a metal jacket. Although RSPA used the term ''shell protection'' to identify these systems, the intent of the NPRM was to require tank cars transporting a PIH *gas* (Division 2.3) to conform to the same requirements as tank cars transporting a PIH *liquid*. For a complete discussion, see *Performance-Oriented Packaging Standards; Miscellaneous Amendments*, Docket HM–181F, 58 FR 50224 (September 24, 1993). In the final rule issued under that docket, RSPA authorized the optional use of an insulated DOT 105S tank car or a non-insulated, but thermally protected, DOT 112J or 114J tank car for poisonous liquids having a PIH hazard.

In its comments to the NPRM, one commenter supported the need for shell protection for PIH materials. Another commenter suggested that, in lieu of a metal jacket, RSPA should establish a performance standard, as with thermal and head protection. Until a performance standard is established, shell-protection resistance should be equivalent to a tank car having a tank test pressure of 20.7 Bar (300 psi) constructed from carbon steel and with a 1/8-inch carbon steel jacket. The commenter stated that the shell-puncture resistance should be based on either a total metal thickness, or an approved calculation. We agree with this commenter that a performance-based standard for shell-puncture resistance may have merit over specification-based standard adopted in this final rule. However, such performance based standards have not been proposed.

Another commenter opposed the use of a metal jacket on pressure tank cars transporting a PIH material on the basis that the FRA's proposal did not support the conclusion that jacketing improves puncture resistance. The commenter further questioned the use of a tank jacket over thicker tank shells, since ''jackets provide thermal not puncture protection.''

In response to similar remarks, RSPA discussed in the NPRM a 1987 RPI report on the vulnerability of pressure tank car shells to puncture.[8] RPI found that shelf couplers, hardboard insulation (cork), increased shell thickness, thermal protection, small tank car size and increased jacket thickness proved effective towards reducing the frequency of shell punctures. The RPI report summarizes a 20½-year history of accident data on shell punctures of pressure tank cars and concludes that the 11-gauge steel jacket provides a measure of shell protection. In addition to RPI's report, FRA also found, in a research contract awarded to the AAR, that puncture resistance is strongly influenced by impact location, by head and jacket thickness and by insulation thickness.[9]

RSPA explained earlier, in Docket HM–181, that the purpose of a metal jacket is to provide ''both accident damage and fire protection'' for certain [liquid] PIH materials.[10] This final rule expands that philosophy to all PIH materials [including compressed gases] and authorizes the use of an insulated class DOT 105S tank car or a non-insulated, but thermally protected, class DOT 112J or 114J tank car.

F. Self-Energized Manways Located Below the Liquid Level of the Lading

RSPA proposed in the NPRM to prohibit the use on tank cars of a self-energized manway located below the liquid level of the lading. The proposal was based on a September 8, 1987 railroad yard incident in New Orleans, Louisiana.[11] In this incident, a tank car equipped with a self-energized bottom manway and loaded with butadiene developed a leak and caught fire. At one point during the incident, the flames were large enough that both spans of a bridge on Interstate 10 were engulfed. After the investigation, NTSB concluded that ''it is unlikely that a hazardous material leak through a bottom manway during transportation could be stopped.'' NTSB urged FRA to prohibit the transportation of tank cars that have a manway opening located below the liquid level of the lading in hazardous materials service. Because the design of bottom manways depends in part on the weight of the product and the pressure in the tank to make the seal fully effective, this type of closure system becomes vulnerable to releasing product when the lading is displaced within the tank. Therefore, we agree with NTSB's conclusion.

In its comments to the NPRM, the AAR, RPI, and several other commenters supported the proposal to remove self-energized manways located below the liquid level of the lading. A commenter stated that their design incorporates an externally elliptically shaped ring clamp which is bolted to the manway closure plate with numerous closely-spaced studs around the circumference of the ring. This commenter holds two DOT exemptions (DOT-E 5493 and DOT-E 6117) to operate tanks cars in hydrogen sulphide service with this design. RSPA and FRA believe that this design is certainly preferable to that used on the car that leaked and burned in New Orleans and is similar to a more conventional external flange, however, we believe this design still remains a potential source of leaks since it is located below the liquid level of the lading. Based on these reasons, RSPA will grant the exemption holder a reasonable amount of time to phase out the use of these tank cars.

While some commenters agreed with a 2-year phase out program of self-energized manways, NTSB stated that RSPA should immediately prohibit such manways, and the AAR suggested a one-year phase-out program.

Based on these comments, this final rule prohibits the construction of new tank cars having an internal self-energized manway located below the liquid level of the lading. This prohibition is added in § 179.103–5. Based on NTSB's comments, compliance with this provision is required beginning on the effective date of this final rule.

G. Non-Pressure Tank Cars for Materials Poisonous by Inhalation

In the NPRM, RSPA proposed to prohibit the use of non-pressure tank cars (e.g., class DOT 111A) for materials poisonous by inhalation.

In a recent research report, FRA found that, in a single-car national risk profile, the transportation of ethylene oxide in a DOT 111A100W4 tank car involves significantly greater risk than transportation of the same material in a

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[8] Phillips, E.A., *Review of Pressure Car Shell Puncture Vulnerability*, RA–09–6–52, (1987), AAR-RPI Railway Tank Car Safety Research and Test Project, AAR Technical Center, Chicago, Illinois.

[9] [Coltman, M., & Hazel, M., Jr., *Chlorine Tank Car Puncture Resistance Evaluation*, (1992) Federal Railroad Administration, Washington, D.C. (NTIS DOT/FRA/ORD–92/11).

[10] *See* the final rule on *Performance-Oriented Packaging Standards; Miscellaneous Amendments*, Docket HM–181F, 58 FR 50224 (September 24, 1993), and the NPRM, 58 FR 37612 (July 12, 1993).

[11] *Butadiene Release and Fire from GATX 55996 at the CSX Terminal Junction Interchange, New Orleans, Louisiana, September 8, 1987*, National Transportation Safety Board Report NTSB/HZM–88/01, National Transportation Safety Board, Washington, D.C.

DOT 105J500W tank car.[12] Characteristics and parameters evaluated in this assessment included the toxicity, fire hazard, and explosion hazard. In comments to the ANPRM, RPI reported that, during the time period of 1965 through 1986, class DOT 111A tank cars involved in accidents and damaged were slightly more than three times as likely to lose lading as were class DOT 105 cars in similar situations.[13]

The Raj/Turner report amply demonstrates (and AAR/RPI Tank Car Safety Test and Research Project data support) that it is ''improbable'' to assume that any single tank car (e.g., DOT 111A or DOT 105) would be involved in an accident. However, based on FRA accident data referenced earlier regarding DOT 111A and DOT 105 tank cars, a significant number of such cars will be involved in accidents during their service life.

Several commenters supported disallowing the use of non-pressure tank cars for the transportation of PIH materials. Because of the hazards associated with PIH materials and the performance superiority of the so-called ''pressure'' tank cars for this service, RSPA agrees with the commenters. This final rule removes the class DOT 111A tank car as an authorized packaging for Division 2.3 materials on the effective date of this final rule.

H. Phasing Out of Various ''Grandfather'' Provisions

In the NPRM, RSPA proposed to remove from the HMR several grandfather provisions that affect tank cars. The grandfather provisions allow tank cars built before a certain date to remain in service without modification. As an example, in § 173.314(c), Notes 23 and 24 allow the continued use of class DOT 105A tank cars for certain compressed and flammable gases if they were built before September 1, 1981, while tank cars built after that date must meet a more stringent class DOT 105S or 105J standard.

NTSB stated, in a March 1, 1988 letter to RSPA, that tank cars failing to meet current minimum safety requirements should no longer be used for transportation of hazardous material under grandfather provisions. NTSB stated that these grandfather provision could result in a reduced level of safety. The AAR also petitioned RSPA to amend § 173.314(c) Note 30 (P–1138), stating that it does not provide any assurance that tank cars with head protection will be used for PIH gas service in the foreseeable future because companies will be able to use tank cars without head protection for PIH compressed gas service for the next 30 years. Other commenters agreed that the grandfather provisions proposed for removal in the NPRM are no longer compatible with the needs of safety.

Based on these comments, RSPA is removing certain grandfather provisions. In § 171.102, special provision ''B63'' is removed to disallow the use of DOT 105A100W, 111A100W4, 112A200W, and 114A340W tank cars for ''ethyl chloride'' and ''ethyl methyl ether.'' Prior to the issuance of Docket HM–181, these two materials were classed as flammable liquids. Because these tank cars do not have head protection or thermal protection systems, they do not provide an equivalent level of safety compared to other tank cars used for Division 2.1 materials. Also, special provision ''B63'' is removed from column 7 of the § 172.101 table entries for these two hazardous materials, thereby prohibiting the use of non-protected tank cars.

Other changes are made to disallow the use of class DOT 111A non-pressure tank cars for Class 2 (compressed gas) materials, such as ''ammonia solutions,'' ''ethylamine,'' ''ethyl chloride,'' and ''ethyl methyl ether.'' This final rule also removes the DOT 111A100W4 car as a packaging for ''ethylene oxide'' in § 173.323(c)(1).

I. Bottom-Discontinuity Protection for Bottom Outlets

In the NPRM, RSPA proposed to require bottom-discontinuity protection (e.g., for bottom outlets) on tank cars. The proposed requirements were intended to simply adopt the requirements published by the AAR. In July of 1979, the AAR required bottom-discontinuity protection for new tank car construction. Over a period of years, these requirements were extended to existing tank cars on a priority schedule determined by the nature of the commodity transported. The AAR's program for bottom-discontinuity protection consists of either a metal ''skid'' protecting the portion of the bottom outlet that protrudes beyond the shell or the machining of a ''breakage groove'' in the valve assembly.

AAR, the Chlorine Institute, CMA, and several other commenters supported the adoption of bottom-discontinuity protection for tank cars, provided such protection was consistent with the AAR requirements. API asked RSPA to clarify the requirements for bottom-discontinuity protection in this final rule. API and several other commenters stated that the proposed rule would require the modification of a number of tank cars, built before July 1, 1979, because most were modified according to Appendix Y and not paragraphs E9.00 or E10.00 of the AAR Specifications for Tank Cars. Appendix Y permits three levels of protection for allowing the types of discontinuity: bottom outlets that extend 1 inch or more; blind flanges and washouts that extend 2 and 5/8 inches or more; and sumps and internally closed washouts that extend 5 inches or more. Paragraphs E9.00 and E10.00 generally require the protection of each valve and fitting from mechanical damage by the tank, an another protective device, or the underframe.

Several other commenters stated that the proposed rule would also require the modification of all existing tank cars, including those that do not transport hazardous materials. The Sulphur Institute and another commenter opposed the need to add bottom-discontinuity protection to existing tank cars that transport sulfur, molten, claiming that such protection has little practical benefit.

In the public hearing held on January 6, 1994, in Washington, D.C., FRA stated that it was not the Department's intention to require the modification of previously modified tank cars, nor to require bottom-discontinuity protection for tank cars that transport materials not subject to the HMR.

In this final rule, RSPA requires bottom-outlet protection that conforms to paragraphs E9.00 and E10.00 of the AAR Specifications for Tank Cars, M–1002, for all new tank cars equipped with bottom unloading devices. Existing tank cars, without bottom-discontinuity protection, used for the transportation of hazardous materials must conform to the above paragraphs no later than 10 years after the effective date of this final rule. Existing tank cars that conform to the bottom-discontinuity protection requirements of Appendix Y of the AAR Specifications for Tank Cars, M–1002 may continue in use after the effective date of this final rule. This final rule does not require the modification of existing tank cars that transport materials not subject to the HMR.

J. Protective Coatings on Insulated Tank Cars

In the NPRM, RSPA proposed use of protective coatings on the exterior of a

[12] Raj, P.K., and Turner, C.K., *Hazardous Materials Transportation In Tank Cars/Analysis of Risks—Part 1*, NTIS DOT/FRA/ORD–92/34, (1993), Federal Railroad Administration, Washington D.C.

[13] Phillips, E.A., *Analysis of Tank Cars Damaged in Accidents 1965 through 1986*, RA–02–6–55, (1989), AAR-RPI Railway Tank Car Safety Test and Research Project, AAR Technical Center, Chicago, Illinois.

tank car and the interior of a tank car jacket to retard rust or corrosion. The proposal was in response to an AAR petition (P–1050) and FRA's findings of severe corrosion or pitting on the outer surface of the tank shell, or the inner surface of the tank jacket, of insulated tank cars. It is not known whether the corrosion stems from the physical properties of the insulation itself or whether the corrosion develops when insulation becomes impregnated or contaminated with water or a chemical from the atmosphere in which the tank car operates. Research within the industry has led to the development of protective coating materials.

Most commenters supported the proposal. One commenter stated that acid-resistant protective coatings should be applied. The commenter further stated that several manufacturing and repair shops are using non-acid resistant latex coatings under polyurethane-foam insulations. Another commenter suggested that the rule should be clarified to exclude tanks or jackets manufactured with self-protective materials such as stainless steel. Still another commenter asked RSPA to consider adopting a recommended practice for applying protective coatings on tank cars that is now under development by the National Association of Corrosion Engineers.

With regard to these comments, this final rule simply modifies §§ 179.100–4 and 179.200–4 by removing the exception for polyurethane-foam insulations. Each of the current sections, and the proposed rule, only require a protective coating on a carbon steel tank shell and tank jacket. Concerning the comment on acid-resistant coatings, RSPA agrees that applied coatings should prevent any corrosive attack to the tank metal. RSPA and FRA will explore, in cooperation with the AAR, CMA, and RPI, the need for and development of acid-resistant coating standards.

NTSB commented that the proposed rule does not sufficiently address the potential problem of existing tank cars. NTSB further noted that a requirement to apply a protective coating on an existing tank car, only when the jacket is removed to repair a tank, cannot ensure that corrosion problems will be detected before the tank corrodes through and releases its lading. NTSB stated that, at a minimum, tank cars currently in use without protective coatings should be inspected periodically for corrosion damage and tank cars found with corrosion damage should be required to have appropriate repairs.

We agree with NTSB, and in this final rule require, under Docket HM–201, new inspection intervals for materials that are corrosive to the tank and a thickness performance measurement to ensure that the tank shell is not corroded below the minimum shell thickness as prescribed by the AAR. RSPA and FRA believe that HM–201 is responsive to NTSB's concerns.

In this final rule, RSPA is requiring protective coatings for all new tank cars and for existing tank cars when a repair to the tank car requires the complete removal of the jacket, as suggested by commenters.

K. Halogenated Organic Compounds (HOC)

To address a 1991 NTSB safety recommendation,[14] RSPA proposed in the NPRM to require the use of a tank car with enhanced puncture resistance if the tank is used to transport one or more of the 100 HOC compounds listed in 40 CFR Part 268 Appendix III. The Appendix III list was developed by EPA pursuant to statute (42 U.S.C. 6924) in order to prohibit the land disposal of certain compounds having a carbon-halogen bond, and that have the potential to harm human health and the environment (these EPA compounds were identified as the ''California List'' under the statute [*See also* 40 CFR 268.32]).

Many commenters opposing regulation of the EPA compounds suggested that RSPA should continue to only regulate the compounds identified as hazardous substances in Appendix A to Part 172. Commenters further suggested that DOT should not consider the HOC concentration threshold for those compounds. Several commenters stated that the regulatory action proposed by RSPA is unnecessary, that RSPA should discontinue its efforts to regulate these EPA compounds, and that RSPA should not consider extending enhanced tank car standards to those carrying the more than 1,000 chemicals prohibited from land disposal.

API, CMA, and several other commenters suggested that the threshold quantities for the EPA compounds are too low for transportation purposes. The EPA threshold in 40 CFR 268.32 is 1,000 milligrams per liter (mg/l) for liquids and 1,000 milligrams per kilogram (mg/kg) for solids.

CMA furnished a benefit/cost analysis, prepared by Reebie Associates, that used 1992 TRAIN II data; thereby updating the previous work performed by AAR, CMA, and RPI addressed in the NPRM. The CMA report shows that a total of 3,893 tank cars transported an EPA compound. CMA's list and the number of tank cars used for such compounds follows:

Hazardous substances	CMA's 1992 population	AAR/CMA/RPI agreement (based on 1988 data)	Currently in pressure tank cars	Remaining
1,1-Dichloroethylene	1	.....	.....	1
1,2-Dichloroethane	236	236	.....	.....
1,2-Dichloropropane	31	.....	.....	31
Carbon tetrachloride	312	312	.....	.....
Chlordane	10	.....	.....	10
Chlorobenzene	105	105	.....	.....
Chloroethane (ethyl chloride)	106	.....	106	.....
Chloroform	227	227	.....	.....
Chloropropene	7	.....	.....	7
CIS 1,3-dichloropropane	42	.....	.....	42
Dichlorodifluoromethane	224	.....	224	.....
Dichlorofinroromethane	2	.....	.....	2
Dichlorofluoromethane	1	.....	.....	1
Hexachlorocyclopentadiene	8	.....	8	.....

[14] *Transportation of Hazardous Materials by Rail,* National Transportation Safety Board Safety Study, Report NTSB/SS–91/01, National Transportation Safety Board, Washington, D.C. (Safety Recommendations R–91–11 and R–91–12).

Hazardous substances	CMA's 1992 population	AAR/CMA/ RPI agree-ment (based on 1988 data)	Currently in pressure tank cars	Remaining
Methylene chloride	2	2	.....	.....
o-Dichlorobenzene	15	15	.....	.....
p-Dichlorobenzene	82	82	.....	.....
Pentachlorophenol	10	.....	.....	10
Tetrachloroethane	13	13	.....	.....
Trichlorobenzene	6	.....	.....	6
Trichloromonofluoromethane	4	.....	4	.....
Vinyl chloride	2,449	.....	2,449	.....
Totals	3,893	992	2,791	110

Commenters stated that RSPA should not include materials that are transported as a solid because, when released, the clean up of these materials is easily achieved. This statement assumes that accidents will not occur near lakes, rivers or streams, or that rainfall will not carry solid residue to such water sources. It is RSPA's and FRA's experience that these types of accidents can occur as evidenced by the metam sodium spill in the Sacramento River in California.

As discussed in the NPRM, these materials were also evaluated by the AAR in an effort to identify materials that have the potential to harm human health and the environment. The AAR analyzed the EPA compounds using a computer model based on EPA and standard chemical dispersion equations. The AAR model describes a method of evaluating the relative environmental hazard of chemicals shipped in tank cars.[15] In addition to the computer model, the AAR surveyed the railroad industry for the clean-up costs associated with a spill of an EPA compound. The AAR considered in their analysis: (1) Compounds that were permitted in non-pressure tank cars by the DOT in 1988; (2) at least one shipment of the compound reported to TRAIN II[16] in 1988; (3) the compounds with an EPA reportable quantity (RQ) of less than 1,000 pounds in 1988; (4) the compounds prohibited from land disposal by the EPA; and (5) the compounds suggested by the railroads' hazardous materials or environmental staff, or the AAR contractor on the project. The results of the 1988 survey identified 10 compounds, transported in class DOT 111A tank cars at that time, that pose a potential threat to human health and the environment. These compounds were:

Carbon tetrachloride
Chlorobenzene
Chloroform
Dichlorobenzene
Ethylene dibromide (1,2-Dibromomethane)
Ethylene dichloride (1,2-Dichloroethane)
Methyl chloroform (1,1,1-Trichloroethane)
Methylene chloride (Dichloromethane)
Perchloroethylene (Tetrachloroethene)
Trichloroethylene (Trichloroethene)

The results of AAR's analysis show that, within the last 10 years, the release of these compounds in railroad accidents has resulted in environmental clean-up costs exceeding $50 million. Even though these materials accounted for less than one percent of the total volume of hazardous materials, their releases accounted for 60 percent of all railroad environmental clean-up costs. Based on the results of the analysis, the AAR, CMA, and RPI have agreed that by January 1, 2000, these 10 compounds should be transported only in a DOT 105S200W or a DOT 112S200W tank car manufactured from AAR TC–128 normalized steel. One of the 10 compounds, ''ethylene dibromide,'' is a compound that is poisonous by inhalation (Zone B).

As shown by CMA, 3,893 tank cars were used to transport these ''EPA compounds''; of that total, ''chloroethane,'' ''dichlorodifluoromethane,'' ''hexachlorocyclopentadiene,'' ''trichloromonofluoromethane,'' and ''vinyl chloride'' represent 2,791 tank cars, or 72 percent of the total. Because the packaging authorizations for these compounds currently require the use of classes DOT 105J, 112J, 112T, 114J, 114T tank cars, these tank cars currently meet the proposed standard.

As noted above, AAR, CMA, and RPI agreed to use only DOT 105S200W and 112S200W (or better) tank cars: These compounds are transported in 992 dedicated tank cars. CMA identified an additional 110 tank cars that are used to transport an EPA compound, but lie outside of the industry agreement. Because these 110 additional tank cars represent a potential risk to human health and the environment, RSPA believes it is reasonable to require the same level of protection for the additional tank cars identified by CMA, based on the 1992 TRAIN II data, as those identified by the AAR, CMA, and RPI, based on the 1988 TRAIN II data. It simply cannot be argued that the shipment of an EPA compound identified after 1988 poses less risk in transportation than if the EPA compound would have been identified by the AAR, CMA, and RPI in 1988. Furthermore, because the AAR, CMA, and RPI agreement does not preclude the use of a non-protected tank car in transportation by any one member or nonmember of the agreement, such cars may still be used.

After considering each of the comments, RSPA agrees it should only regulate those EPA compounds listed in the HMR. After reviewing the 100 EPA compounds (*listed in 40 CFR 268 Appendix III*), RSPA found that all but 16 of the compounds are currently identified as a hazardous substance. The 16 compounds are:

Bis(2-chloroethoxy)ethane
Bis(2-chloroethyl)ether
Bromomethane
2-Chloro-1,3-butadiene
3-Chloropropene
1,2-Dibromomethane
Dibromomethane
Hexachlorodibenzo-p-dioxins
Hexachlorodibenzofuran
Iodomethane
Methylene chloride
Pentachlorodibenzo-p-dioxins

[15] Löwenbach, William, A., *Consequence Models of Hazardous Materials Releases on Railroads*, Association of American Railroads (1989), Washington, D.C.

[16] The Association of American Railroads (AAR) data network, Tele-Rail Automated Information Network (TRAIN II), collects information on approximately 90 percent of the rail traffic originating and terminating in the United States. Users of the network can trace individual car movements or gather information on a particular cargo moving by rail. The AAR uses the data to develop statistical trends in both car movement and commodity flow.

Pentachlorodibenzofuran
Tetrachlorodibenzofuran
Tribromomethane
1,2,3-Trichloropropane

More than 30 of the compounds are listed by proper shipping name in the § 172.101 Table. As a group, the EPA compounds include: volatiles (35 compounds); semivolatiles (33 compounds); organochlorine pesticides (20 compounds); phenoxyacetic acid herbicides (3 compounds); PCBs (all PCBs); and dioxins and furans (7 compounds).

Based on this review, this final rule requires that, when the EPA compounds listed in the HMR are transported in large capacity tank cars, the tank cars must conform to a limited and designated specification with greater protection in accidents. Also, to ensure the proper identification and packaging of these materials, RSPA is listing (with the exception of Class 2 materials [compressed gases], PIH materials, and the 16 materials not now identified as hazardous substances) in § 173.31(f), all EPA compounds listed in 40 CFR Part 268, Appendix III. As explained elsewhere in the preamble, RSPA is no longer authorizing Class 2 materials or PIH materials in low-pressure tank cars, e.g., class DOT 111A.

Because RSPA is listing the EPA halogenated-organic compounds as hazardous substances, in this final rule, the threshold quantity is the reportable quantity of the hazardous substance. As an example, if the material in the tank car (including its mixtures and solutions) (1) is listed in Appendix A to § 172.101, (2) *is in a quantity that equals or exceeds the reportable quantity (RQ) of the material listed in Appendix A,* and (3) is listed in § 173.31(f), it must be transported in a tank car of limited and designated specification to offer greater protection in the event of an accident.

In the NPRM, RSPA proposed that any of the halogenated organic compounds identified by EPA must be transported in a tank car meeting DOT 105S200W, DOT 112S200W with an 11-gauge metal jacket, or DOT 112S340W without a metal jacket. RSPA stated that the metal jacket and head protection on these tank cars blunt the impacting forces from couplers, wheels, track, and other objects along the carrier's right-of-way. According to FRA research, this blunting effect is directly proportional to the thickness of the tank jacket or head shield and is effective in preventing tank punctures.[17] The NPRM would have allowed the use of any class DOT 105 or DOT 112 tank car regardless of its date of construction. Older tank cars would be allowed, including those constructed with an older steel specification, such as ASTM A212 Grade B. Because the older steels have less puncture resistance than the steels currently in use, the NPRM proposed the use of an external metal jacket to help blunt any impacting force, as a result of an accident, to the tank shell.

At the January 6, 1994, public hearing, a commenter asked RSPA to consider the use of a non-jacketed DOT 112S200W tank car, provided that the tank car was constructed from an AAR normalized high-strength steel specification, AAR TC–128. This steel specification has high tensile and yield strength. In addition to the higher tensile and yield strengths, commenters stated that normalization of the steel adds extra puncture resistance. A commenter further stated that a tank car constructed from the AAR's TC–128 steel specification would provide a level of puncture resistance comparable to that of tank cars proposed for use in the NPRM, and would also render a indisputable benefit/cost ratio. Upon further review, RSPA agrees that a tank car constructed from AAR TC–128, normalized, would provide a level of puncture resistance equivalent to a tank car constructed from any steel specification proposed in the NPRM. In this final rule, RSPA has provided for the use of a DOT 112S200W (non-jacketed tank car) constructed from AAR TC–128 normalized steel as an authorized packaging, as suggested by the commenter.

L. Implementation of New Requirements

In the NPRM, RSPA proposed two implementation dates. Under ''Option A,'' most of the compliance dates were set at 10 years from the effective date of this final rule. This is a period that also coincides with the duration frequently specified in typical full-term tank car leases, whether a true lease or a financing vehicle; and with the ''thorough inspection'' interval for tank cars in Interchange Rule 88.B.2.[18] Under ''Option B,'' RSPA proposed that certain tank car types and car/commodity combinations be considered for shorter retrofit periods, with 5 years given to bring existing cars into compliance. For instance, aluminum and nickel tank cars are more vulnerable to puncture, and tanks used for transporting PIH materials present special hazards.

Option A was supported by commenters. Although urging RSPA to adopt the 10-year time limit, RPI stated that, because of start-up complexities, it will not be reasonable to accomplish this on a 10-percent per year basis. Instead, RPI suggested that its members were willing to modify 50 percent of the fleet in the first 5 years and 50 percent in the second 5 years. This accomplishes the desired goal while minimizing scheduling problems and maximizing efficiency.

Option B was supported by NTSB who stated that RSPA should require tank-head protection, within 5 years, for all class DOT 105 tank cars having capacities of less than 70 kl (18,500 gallons) when used to transport a Division 2.1 material (flammable gas).

Most commenters supported the 10-year modification program for existing tank cars. RSPA believes, however, that a 5-year modification program is more appropriate for class DOT 105 tank cars that have a capacity less than 70 kl (18,500 gallons) when used to transport a Division 2.1 material. Mandating an accelerated modification program for these particular tank cars will ensure that those cars presenting the greatest risk are modified first. Therefore, this final rule requires that each tank car built on or after the effective date of this final rule conform to this final rule. For tank cars built prior to the effective date, the phase-in period is 10 years: at least 50 percent of the fleet in the first 5 years and the balance in the second 5 years. The phase-in-period for tank cars transporting a Division 2.1 material is 5 years, with at least 50 percent within 2½ years and the balance in the second 2½ years. For existing tank cars constructed with an internal self-energized manway located below the liquid level of the lading, the compliance date is the effective date of this final rule.

III. Docket HM–201—Detection and Repair of Cracks, Pits, Corrosion, Lining Flaws and Other Defects of Tank Car Tanks

A. Background

On September 16, 1993, RSPA published in the Federal Register a NPRM under Docket HM–201; Notice No. 93–15 [58 FR 48485]. The NPRM contained proposals to: (1) require the development and implementation of a quality assurance program (QAP) at each facility that builds, repairs, or ensures the structural integrity of tank

[17] Coltman, M., & Hazel, M., Jr., *Chlorine Tank Car Puncture Resistance Evaluation,* Report DOT/FRA/ORD–92–11, Federal Railroad Administration (1992), Washington, D.C.

[18] *Field Manual of the Interchange Rules,* adopted by the Association of American Railroads, Mechanical Division, Washington, D.C., 1992. At intervals not to exceed 10 years, major components of the car must be inspected, including body bolsters and center plates, center sills, crossbearers, crossties, draft systems and components, end sills, side sills, and trucks.

cars; (2) require the use of non-destructive testing (NDT) techniques in lieu of the current periodic hydrostatic pressure tests for fusion welded tank cars to more adequately detect cracks in principal structure elements (PSE), the failure of which could cause catastrophic failure of the tank; (3) require thickness measurements of tank cars; (4) allow for the continued use of tank cars with limited reduced shell thicknesses; (5) increase the inspection and test intervals for tank cars; and (6) clarify the tank car pretrip inspection requirements. Readers are referred to the NPRM preamble for a complete background, including a more extensive discussion of issues and citations to research data summarized in the final rule.

RSPA received 31 comments in response to the NPRM from members of the various industries that own, lease, transport, or use tank cars. RSPA and FRA have given full consideration to all comments in the development of this final rule. Following is a summary of the written comments, a summary of the final rule, and the actions taken by RSPA and FRA in this final rule:

B. Damage-Tolerance Fatigue Evaluations

In 1992, the NTSB issued a report on the inspection and testing of tank cars. The report disclosed that many tank car defects are not routinely detected. These defects may suddenly grow to a critical size resulting in failure of the tank car. The NTSB recommended that FRA and RSPA develop requirements for the periodic inspection and tests of tank cars to help ensure the detection of cracks before the cracks propagate to a critical length. Such requirements would establish inspection and test intervals based on the defect size detectable by the inspection and test method used and on the stress level and crack propagation characteristics of the PSE based on a ''damage-tolerance'' approach. The Federal Aviation Administration (FAA) defines a structure as damage tolerant if the structure has been evaluated to ensure that, should serious fatigue, corrosion, or accidental damage occur within the operational life of the structure, the remaining structure can withstand reasonable loads without failure or excessive structural deformation until the damage is detected (FAA Advisory Circular AC No. 25.571–1A). Damage-tolerance assumes that flaws exist in the structure and that the design of the structure is such that these flaws will not grow to a critical size and cause catastrophic failure to the structure within a specified damage detection period. The damage detection period depends on the characteristics of each PSE, each element's susceptibility to severe corrosive environments, the inspectability of each element, the inspection method, and procedures used and maintenance practices.

In the NPRM, RSPA proposed to allow tank car owners to use an alternative inspection and test procedure or interval based on the completion of a damage-tolerance fatigue evaluation. The evaluation procedures would be reviewed by the AAR and approved by the Associate Administrator for Safety, FRA. As stated in the NPRM, FRA believes that some tank car owners may be able to reduce inspection and test costs by using damage-tolerance fatigue evaluation procedures that incorporate: (1) In-service inspection and test using techniques such as ultrasonic or acoustic emission; (2) sampling of individual designs with a 100 percent inspection and test of the design if a crack is found; (3) inspection and test intervals unique to each tank car component; and, (4) inspection and test intervals based on the degree of risk a material poses (i.e., high risk materials have shorter inspection and test intervals than those with low risks).

Most commenters stated that the damage-tolerance approach is a significant step toward advancing the detectability of defects and well suited to a tank car and its associated structure. They suggested that RSPA and FRA expand the damage-tolerance approach, for fatigue, to include other types of damage mechanisms, such as corrosion, corrosion fatigue, original fabrication defects, stress corrosion cracking, impact damage, and damage caused by an accident.

RSPA and FRA agree that the use of a damage-tolerance approach to periodic inspection and test of tank cars would substantially increase the likelihood of the detection of cracks and crack-like defects before such defects propagate to a critical size. RSPA and FRA also believe that the inspection interval for each PSE should be based on the inspection method used, the stress level in each PSE, and the crack propagation characteristics of each PSE.

The agencies realize, however, that in order to fully implement a damage-tolerance program, it will take years for each owner or manufacturer of a tank car to analyze each element on the tank car, and to support the results of such analysis with test evidence and service experience. FRA is currently working with the AAR Tank Car Committee, the RPI, tank car owners, lessors, and manufacturers to develop acceptable non-destructive testing techniques, and to develop an inspection and test program based on damage-tolerance principles. These programs include finite element analysis of the stub sill and its attachment to the tank shell to identify the PSE on the tank car that should be examined, over-the-road tests to define the typical environmental loading spectrum expected in service, and a damage-tolerance evaluation of the structure.

In this final rule, RSPA is revising the regulatory text for the damage-tolerance fatigue evaluation proposed in § 180.509(k). This revised requirement provides that an acceptable damage-tolerance and fatigue evaluation include other types of damage mechanisms and is supported by test evidence and, if available, by service experience.

C. Inspection and Test Intervals

FRA found that cracks may reach a critical size in a PSE within about 400,000 miles of railroad service [*see* ''Owners of Railroad Tank Cars; Emergency Order Requiring Inspection and Repair of Stub Sill Tank Cars,'' (Emergency Order Number 17) 57 FR 41799, September 11, 1992]. To ensure against premature failure, common procedures for NDT allow for two opportunities to inspect an item before predicted failure. Because tank cars travel an average of about 18,000 miles per year and most cracks become critical at about 400,000 miles of railroad service, in the NPRM, RSPA proposed an inspection and test interval, based on a simplified damage-tolerance evaluation, of 10 years to allow for two opportunities to inspect an item before predicted failure.

For the sake of efficiency, and to increase safety margins for most cars, RSPA proposed to implement the 10-year inspection and test interval starting at what would otherwise be the next scheduled tank hydrostatic pressure test. For tank cars within a 20-year test cycle, RSPA proposed that the next inspection and test date be the publication date of this rule plus one half of the remaining years to what would otherwise be the next scheduled tank hydrostatic test. After that the tank would require an inspection and test on a 10-year interval.

For materials corrosive to the tank and shipped in non-lined or non-coated tank cars, RSPA proposed an inspection and test interval based on the lower of (1) the corrosion rate of the material on the tank shell or (2) the fatigue life of the tank structure as discussed above. RSPA and FRA developed a test interval to ensure that the calculated thickness of the tank at the next inspection and

test will not fall below the proposed allowable minimum wall thickness. The inspection and test interval in this case is calculated by subtracting the actual thickness (measured at the time of construction or any subsequent inspection and test) from the allowable minimum thickness and then dividing that difference by the corrosion rate of the hazardous material on the tank. Consequently, as the shell thickness corrodes throughout the service-life of the tank, the tank must receive an inspection and test more frequently.

Commenters supported the proposed inspection and test program for most tank cars. They suggested, however, that RSPA consider the availability of tank car facility space and the practicality of implementing the new inspection and test and quality assurance programs without immobilizing a large number of tank cars. In particular, commenters suggested that RSPA not reduce the inspection and test intervals for tank cars constructed during the 1975–1979 period that are now subject to a 20-year hydrostatic pressure test interval. As proposed, these particular tank cars become due for inspection and test during the years 1995 through 1997. A major oil company stated that these particular tank cars represent at least 20 percent of its tank car fleet.

Several commenters stated tank cars used to transport chlorine, unlike other tank cars, are currently tested every two years. As such, all 8,000 tank cars in chlorine service would have to be brought in conformance with the new inspection and test requirements within two years. One company stated that it maintains 3,000 tank cars in chlorine service and it would have to inspect 5.7 tank cars per day, which may not be feasible because companies must first determine efficient inspection techniques and provide training to inspection personnel. Commenters further argue that because tank cars that transport chlorine have an insulation system and a metal jacket, the inspectability of certain PSE on these tank cars is difficult; accordingly, RSPA should not mandate the new requirements in the short-term until the industry and the government specify the acceptable NDT techniques for inspecting tank cars that have metal jackets.

The RPI suggested that RSPA phase in the new procedures slowly by beginning with tank cars without a metal jacket and then tank cars having a metal jacket when appropriate inspection techniques are developed. Although RPI did not explain the basis for its comment, RSPA and FRA assume that the reason behind RPI's comment is the difficulty of inspecting PSE on a tank car having an insulation system covered by a metal jacket or a thermal protection system; consequently, tank car facilities will need time to develop the inspection methods and to train inspection personnel on the use of those methods. Only after identifying the appropriate inspection method and by training inspection personnel, will there be a high probability of defect detection.

Several commenters requested that RSPA not require, in proposed § 180.509(b)(3), an inspection and test [requalification] of the tank each time it is transferred into or out of a service that is corrosive to the tank, which one commenter stated could occur 4 times per month. Another commenter stated that the program is redundant with proposed § 180.509(c)(3)(ii) and, therefore, the section should be deleted. The Chemical Manufacturers Association (CMA) suggested that RSPA amend the proposal to allow for routine transfers, so long as the tank car is within the established intervals for the periodic inspection requirements. A commenter suggested that localized modifications to a tank, such as modifying nozzles or bottom outlets, should not subject the tank to a complete requalification.

Based on the comments received, RSPA is not adopting proposed paragraphs (b) (3) and (4). Paragraphs (b) (5) and (6) are renumbered accordingly.

RSPA and FRA also agree that local repairs or modifications should not subject the tank to the full inspection and test program, because the repair or modification must be done according to Appendix R of AAR's Specifications for Tank Cars. Appendix R specifies the procedures for repairs, alterations, and conversions of tank cars and the appropriate non-destructive testing method to ensure that the repairs, alterations, or conversions were performed correctly.

RSPA and FRA agree that the new inspection and test methods, combined with other FRA mandated inspection programs, may cause a tremendous backlog of tank cars awaiting inspection. Therefore, to maintain an acceptable level of safety, but also to allow for an orderly and acceptable phased-in NDT inspection and test program, RSPA will delay the compliance date of this final rule for 24 months for tank cars without metal jackets and 48 months for tank cars having a metal jacket or a thermal protection system. Before the compliance date, tank cars may be given an inspection and hydrostatic test in accordance with the current requirements or the requirements contained in this final rule. After the compliance date, each tank car must be given an inspection and test according to the requirements contained in this final rule on or before the next scheduled tank hydrostatic pressure test date.

D. High-Mileage Tank Cars

FRA realizes that some tank cars can travel in excess of 18,000 miles each year and, by doing so, the tank cars may reach 200,000 miles of railroad service before their first periodic inspection and 400,000 miles before their second.

The NTSB expressed its concerns that the proposed regulations recommend, but do not require, more frequent inspections and tests for tank cars with mileage rates that exceed the average. Further, because there is no requirement to maintain cumulative mileage on individual tank cars, the NTSB expressed concern that high-mileage tank cars would not be identified for the more frequent inspections and tests, thereby increasing the possibility of a non-detected fatigue crack propagating and causing a structural failure within the 10-year inspection and test cycle.

RSPA and FRA agree with the NTSB that high-mileage tank cars should receive an inspection and test prior to reaching 200,000 miles of railroad service. However, no requirement for the maintenance or retention of car mileage records was proposed. Because car owners keep records of car mileage, the owners can ensure that tank cars having high-mileage are inspected more frequently than the inspection and test intervals adopted in this final rule. Current § 173.24(b) provides that each package used for the shipment of hazardous materials shall be so designed, constructed, and maintained . . . so that under conditions normally incident to transportation—the effectiveness of the package will not be substantially reduced. Thus, an owner has an obligation to ensure the continuing effectiveness of a tank car. This duty is not unlike that of an owner of an automobile who replaces the tires on his or her car when worn and not based on the warranty period. FRA will, during its inspection activities, assess the need for a rulemaking (1) to require owners to retain car mileage records and (2) to inspect their tank cars before the cars accumulate more than 200,000 miles of railroad service.

E. NDT Techniques

In the NPRM, RSPA proposed to require that the bottom shell of fusion welded tank cars be inspected periodically by appropriate NDT techniques, such as optically aided visual inspections, ultrasonic,

radiographic, magnetic particle, and dye penetrant testing methods, in lieu of hydrostatic pressure tests.

All commenters supported the use of NDT techniques to assess the integrity of a tank car in lieu of a hydrostatic pressure test. Several commenters stated that the use of qualification procedures will require formal NDT techniques in defined areas where no previous requirements existed and will improve the overall safety of tank cars.

Several commenters suggested that RSPA should authorize the use of acoustic emission testing to qualify tank cars for further use. One commenter stated that acoustic emission testing is widely used in the chemical process industry to assure the integrity of pressure vessels, tanks, and piping. The commenter further stated that the overall reliability of a series of local tests (ultrasonic, dye penetrant, radiography, etc.) is incorrectly compared with the reliability of a single global test (hydrostatic, acoustic emission) and that substitution of multiple local tests for a single global test may endanger, rather than enhance the safe transportation of hazardous materials.

RSPA and FRA do not agree with the commenters's conclusion about the potential danger of multiple local tests as compared with a single global test. RSPA and FRA believe that multiple local tests, focusing on known areas of tank car stress, have a safety advantage over single global tests, at least with the current state of development of acoustic emission testing in the tank car industry. The NDT methods mandated by this rule are a safety improvement. As noted immediately below, the agencies have underscored their belief in the potential benefits acoustic emission testing offers by granting an exemption that will permit its development and refinement in a railroad industry context.

Outside the scope of this rulemaking, but related to it by means of subject matter, Monsanto Chemical Company applied for a DOT exemption to use acoustic emission technology, in lieu of the current hydrostatic retest, for the tank cars it owns. The procedures developed by Monsanto to support its exemption were recently evaluated under a research contract administered by the government of Canada. (McBride, S. L., *Acoustic Emission Tank Car Test Method Review & Evaluation,* Transport Canada Report No. TP 12140E (1994) Montreal, Quebec). The results of that research show that Monsanto's acoustic emission testing procedures appear to be sound. The report suggests, however, minor refinements in the acoustic emission procedures. Taking this into account, RSPA issued Monsanto an exemption on September 9, 1994 (DOT–E 10589). The following companies were granted ''party to'' status on the Monsanto exemption: Union Tank Car Company, Testing Associates, and Physical Acoustics Corporation.

This final rule does not include acoustic emission testing as an authorized NDT technique. RSPA and FRA are committed, however, to explore new technologies for inspecting and testing tank cars and will continue to evaluate the possibly of authorizing the acoustic emission testing procedure in the future. In support of this commitment, FRA issued a research contract to further explore and refine the use of acoustic emission testing procedure and other NDT techniques in determining the integrity of insulation and lining covered welds of tank cars.

F. Leakage Test

In the NPRM, RSPA proposed a leakage test that would include all product piping with all valves and accessories in place and operative, except that during the test the tank car facility would remove or render inoperative any venting devices set to discharge at less than the test pressure. As proposed, the test pressure would be maintained for at least 5 minutes at a pressure of not less than 50 percent of the tank test pressure.

Most commenters opposed the proposed change to use 50 percent of the tank test pressure as the standard, because these pressures, some as high as 300 psig, would constitute an unsafe maintenance practice. RSPA proposed the leak test to ensure that when valves, fittings, and manway cover plates are replaced on a tank car after an inspection and test, that valves and fittings are securely applied and in a ''leak-free'' condition under normal operating pressures. This will help ensure against product leakage from a valve, fitting, or manway cover plate should the vapor pressure of the commodity rise after the shipper loads the tank car, normally on its first trip after an inspection and test at a tank car facility.

Berwind Railway Service Company suggested conducting the leak test at 30 psig for tank cars having a test pressure less than or equal to 200 psig and 50 psig for tank cars having a tank test pressure greater than 200 psig. AAR and RPI supported similar pressures. In the commenters experience, pressures of this magnitude are effective in ensuring that tank cars are released from tank car facilities in a leak free condition.

The suggested leak test pressures are similar to the leak test pressures currently used to qualify highway cargo tanks. For example, the leak test for a cargo tank may not be less than 80 percent of the tank design pressure (or its maximum allowable working pressure [MAWP]); or, the maximum normal operating pressure when the cargo tank has a MAWP equal to or greater than 6.9 Bar (100 psig); or, 4.1 Bar (60 psig) when the cargo tank is used to transport liquefied petroleum gas. After considering the comments, RSPA and FRA agree that a lower leak test pressure would provide an adequate leak test with less risk to persons performing the test. In this final rule, RSPA is requiring a leak test at 30 psig for tank cars having a test pressure less than or equal to 200 psig and a leak test at 50 psig for tank cars having a tank test pressure greater than 200 psig.

G. Bottom Shell

FRA has found that principal structural elements (PSE) located within four feet of the bottom longitudinal centerline are susceptible to fatigue cracking due to repeated loading conditions. Stress concentrations in these areas may cause the formation of small cracks that may not be detected under the current inspection and test procedures. Because some defects may lie outside the area currently defined as the bottom shell, such as those in the attachment welds of bottom discontinuities, RSPA proposed, based on FRA's findings, to revise the current definition of the bottom shell by enlarging the area from 60.96 cm (two feet) to 121.92 cm (four feet) on each side of the bottom longitudinal center line of the tank.

The Chlorine Institute, CMA, and others agreed that experience has shown that the bottom shell is prone to fatigue cracking. However, all known fatigue-related defects have originated within two feet of the bottom longitudinal centerline of the tank, which is the area most highly stressed in train operation.

RPI's comments referenced a report, ''Final Phase 14 Report on the Stub Sill Buckling Study,'' that shows, when stub sill tank cars are subjected to static and dynamic (impact) loads, a complex biaxial stress field results in the shell area between the stub sills. The report shows that measured strains are due to a combination of axial compression and bending components and at high loads, high magnitude strains occur over certain localized areas. The results of the RPI report show that the stresses on the bottom longitudinal centerline of the tank are about 1.8 times the magnitude of the stresses occurring from two to

four feet from the bottom longitudinal centerline.

RPI further stated that fatigue damage increases exponentially with the ratio of stress ranges and that crack initiation and propagation within the area of two feet from the bottom longitudinal centerline is much faster than the area two to four feet from the bottom longitudinal centerline. Based on the Phase 14 report, RPI suggests that the bottom shell definition should encompass an area that lies below the horizontal plane of two longitudinal parallel lines extending two feet on each side from the bottom longitudinal centerline, through the tank heads. K & K Consultants, Incorporated, who also commented on the Phase 14 report provided a summary of the data and explained that the principal stresses in the tank are approximately parallel to the bottom longitudinal centerline, and that the stresses tend to decrease circumferentially away from the bottom longitudinal centerline.

After consideration of the comments, RSPA and FRA agree that four feet on each side of the bottom longitudinal centerline is overly restrictive. Therefore, the current definition of bottom shell in § 171.8 is retained.

H. Structural Integrity Inspections

In the NPRM, RSPA proposed a structural integrity inspection and test on all circumferential and longitudinal welds and welded attachments on the bottom of the tank, within 121.92 cm (4 feet) on each side of the bottom tank centerline, using one or more non-destructive test methods. As explained above under the heading ''bottom shell,'' several commenters stated that this area is more appropriately defined as within 60.96 cm (2 feet) on each side of the bottom tank centerline.

FRA has learned that some high-stressed areas lie outside of the 60.96 cm (2 feet) bottom longitudinal centerline area. Brake pipe supports, body stiffeners, tank anchors, and other attachments and structures having large welds are examples of high-stressed areas that may lie outside of this area. As a general matter, the HMR require reinforcing pads for these high-stressed areas between external brackets and tank shells if an attachment weld exceeds 6 linear inches of 0.64 cm (0.25 inch) fillet weld per bracket or bracket leg (§§ 179.100–16 and 179.200–19). In its Tank Car Manual, AAR requires the use of a reinforcing pad if a bracket or attachment welded directly to the tank could cause damage to the tank, either through fatigue, over-stressing, denting, or puncturing in the event of an accident. If a reinforcing pad is used under a bracket or attachment, AAR specifies that the pad shall not be less than 0.64 cm (0.25 inch) thick. For further information, see sections E15.01 and E15.02 of AAR Tank Car Manual.

Further, in an investigation of tank shell cracking, FRA found that local areas of the tank shell near tank discontinuities are subjected to the combination of live-load stress in addition to the residual stress induced by reinforcement pad welds, and that this combination makes the sensitivity of the welded area near the discontinuity and reinforcing pad weld susceptible to fatigue crack propagation. After performing residual stress measurements of retro-fitted tank car weldments, AAR confirmed FRA's findings that significant tensile stresses (on the order of 30,000 psi) occur in the vicinity of the fillet welds having a throat size (weld depth) greater than 0.64 cm (0.25 inch). In general, fillet welds larger than 0.635 cm (0.25 inch) are considered structural welds, and AAR requires post weld heat treatment when these welds, such as interior brackets, supports, and reinforcement bar pads, have a throat thickness exceeding 0.635 cm (0.25 inch). For further information see R17.01 of AAR Tank Car Manual.

In its comments to the NPRM, the Sulphur Institute stated that stress type defects may originate in some attachment fillet welds, such as those greater than 0.64 cm (0.25 inch) that are currently located outside of the current bottom shell definition. Examples given were body stiffener and brake pipe support fillet welds.

RPI gave similar comments by suggesting that the inspection of attachment welds on the bottom of the tank should be limited to structure welds, such as transverse fillet welds larger than 0.64 cm (0.25 inch), the terminations of longitudinal fillet welds larger than 0.64 cm (0.25 inch), and tank shell butt welds within 60.96 cm (24 inches) of the bottom longitudinal center line and between the body bolsters. When asked to clarify its comments, RPI told FRA that a 0.64 cm (0.25 inch) fillet weld refers to the leg-length (see also the definitions of ''Size [fillet]'' and ''Full Fillet Weld'' in Section W2.00 of AAR Tank Car Manual). Furthermore, RPI stated that limiting the inspection and test requirements to fillet welds greater than 0.64 cm (0.25 inch), would exclude non-structural fillet welds, such as those used to attach exterior heater coils.

RSPA and FRA agree that the stress concentration effects around structural attachments will cause the formation of fatigue cracks and, if these cracks are not detected and repaired during routine maintenance of the tank car, such cracks will grow to failure. In this final rule, RSPA requires a structural integrity inspection and test in those areas known to develop cracks. Such an inspection and test includes transverse fillet welds greater than 0.64 cm (0.25 inch) within 121.92 cm (48 inches) of the bottom longitudinal center line, the termination of longitudinal fillet welds greater than 0.64 cm (0.25 inch) within 121.92 cm (4 feet) of the bottom longitudinal center line, and all tank shell butt welds within 60.96 cm (2 feet) of the bottom longitudinal center line. By limiting the required inspection to known areas of crack initiation, RSPA and FRA can expect an increase in the probability of defect detection, as well as an improvement in the reliability of the inspection results and a reduction in inspection costs.

The Sulphur Institute commented that if the integrity of the coatings or linings applied to protect tank car tank metal remains acceptable, there should be no need to remove the coating or lining to inspect the tank for structural integrity. The purpose of the structural integrity inspection is to ensure the detection of fatigue cracks before the cracks progress to a dangerous size, thereby reducing the residual strength of the tank. In order to inspect each PSE to confirm structure integrity, tank car facilities may need to remove portions of the lining or coating. Owners may choose, however, to use a non-destructive testing method that interfaces between different materials, with effective penetration, so that there will be no need to remove the coating or lining. Such non-destructive testing methods include radiography and ultrasonics.

I. Minimum Shell Thickness

Recognizing that a tank car shell tends to decrease in thickness over time, RSPA proposed in the NPRM a definite service-life shell thickness requirement for all areas of the tank shell and heads. The proposed minimum in-service shell thickness requirement was based, in part, on an AAR–RPI report, ''Allowable Thickness Reduction from Minimum Prescribed Thickness of Carbon Steel Tank Car Tanks,'' that discussed the investigation of shell thickness below the Part 179 construction standard in certain areas. The RPI–AAR report considered the effects of an overall or localized reduction in the tank wall thickness from a principal mode of failure—failure of a tank car due to the effects of fire, fatigue crack growth leading to fracture, and failure of the tank due to puncture of the heads. The results of the RPI–AAR report show that

the effects of a slightly reduced shell thickness on tank cars used to transport ''ethylene oxide,'' ''butadienes, inhibited,'' ''vinyl chloride,'' ''propane,'' and ''propylene'' will not have a significant effect on safety. The NPRM also proposed to allow localized areas of thickness reduction to have a total cumulative surface perimeter not exceeding 182.88 cm (72 inches), consistent with the current provisions in § 173.31(a)(11)(iv).

In its comments to the NPRM, RPI suggested that the 72-inch cumulative perimeter should apply to the bottom shell only. RPI further stated that RSPA should allow the rest of the tank shell, excluding the tank heads, to have an unlimited number of two foot perimeter reductions, provided such areas of reduction are separated by at least 16 inches (twice the diameter of a circle having a 24 inch circumference).

AAR also suggested that the permitted local thickness reductions for non-pressure tank cars should depend on cause. AAR thickness reduction tables, endorsed by many commenters under an earlier rulemaking, differentiated between corrosion and mechanical damage for non-pressure tank cars (see ''Shippers Use of Tank Cars with Localized Reductions in Shell Thickness,'' 54 FR 8336, 8337, February 28, 1989). AAR further commented that there is no need to make a distinction between the cause of damage for pressure tank cars because of the stricter limits imposed on such cars. AAR proposed that, for non-pressure tank cars, RSPA should permit a 0.48 cm (0.188 inch) local thickness reduction in the top shell and 0.32 cm (0.125 inch) local thickness reduction in the bottom shell for corrosive damage. For mechanical damage, RSPA should permit 0.32 cm (0.125 inch) local thickness reduction in the top shell and a 0.16 cm (0.063 inch) local thickness reduction in the bottom shell. AAR asserts that the stresses from a given thickness reduction attributed to mechanical damage can be greater than the same reduction attributed to corrosion damage, because mechanical damage causes a more abrupt change in the thickness.

After full consideration of the merits of these comments, RSPA and FRA agree that there should be no overall limit on the amount of surface area with localized reduced shell thicknesses, provided such limitations apply only to the top shell of the tank and such areas are separated by at least 16 inches. Also, RSPA is modifying the thickness reduction table, as recommended by AAR, and endorsed by several commenters, to differentiate between corrosion and mechanical damage.

AAR commented that RSPA proposed, in § 180.509(g), maximum thickness reductions from the original thickness of the tank and not the required thickness of the tank: a thickness specified in a chart summarizing specification requirements (e.g., § 179.101–1(a)), or the result of a calculation (e.g., § 179.100–6(a)). RSPA disagrees. The proposed section in the NPRM states that—

> [a] tank car found with a thickness below the *required* minimum thickness after forming for its specification, as stated in Part 179 of this subchapter, may . . . [emphasis added]

AAR further stated that RSPA should include an explicit provision enabling the owner of a tank car to ''downgrade'' [downrate] the car to the point where the loss of thickness exceeds the maximum allowed by the regulation. As RSPA stated in the NPRM under the preamble heading, ''Safety System Inspections,''

> [n]othing in the regulations would preclude a tank car owner from marking a tank as meeting a less stringent specification, such as re-marking a specification DOT 112J tank car to a DOT 112S or 112J400W tank specification to a DOT 112J340W tank specification when the tank car no longer conforms to the marked specification.

Downrating is permissible and a tank car owner may mark a tank as meeting a less stringent specification, such as marking a specification 112A340W tank car to a DOT 111A100W1 tank car when the tank, because of its shell thickness, no longer conforms to the marked specification. Owners are reminded that changing the marked specification also changes the certificate of construction and, when so doing, they must follow the procedures in Appendix R of AAR's Specifications for Tank Cars (*see* § 173.31(a)(4) and (f), and § 179.6).

In its comments, RPI proposed a standardized minimum inspection pattern for conducting thickness tests. RPI suggests that thickness readings should be taken at the bottom, one side (90°), and the top within 6-inches of each circumferential weld for each plate. RPI further states that corresponding readings should also be taken along the head circumferential weld seam and another reading at the center of the tank head. This would result in 32 thickness readings for a four-ring tank. In addition to the tank shell, two readings would be taken on the manway nozzle, the top unloading nozzle, and the sump. According to RPI, if an inspector finds corrosion or other damage that reduces the shell thickness, additional readings must be taken to more specifically identify the damaged area.

RSPA is not incorporating a written procedure for conducting thickness measurements throughout the tank shell to increase the probability of defect or corrosion detection. RSPA and FRA believe that such procedures belong in the tank car owner's written maintenance plans or AAR Specifications for Tank Cars. Throughout this rulemaking, RSPA and FRA have developed a course of action that outlines where and what to inspect, but not how to inspect. This approach allows each tank car owner the flexibility to develop inspection and test procedures appropriate for each unique tank car, or a series of unique tank cars based on operating and maintenance experience.

J. Lining and Coating Inspections and Tests

In the NPRM, RSPA proposed an inspection and test requirement for tank cars with linings and coatings. This would ensure that the lining or coating is in proper condition for the transportation of hazardous materials. As proposed, owners of lined or coated tank cars must determine the periodic inspection interval and inspection technique for the lining and coating, based on the owner's knowledge of the material used. The owner would also maintain all supporting documentation used to make such a determination, such as the lining or coating manufacturer's recommended inspection interval and inspection technique, at the owner's principle place of business. Further, the supporting documentation used to make such inspection interval determinations and the inspection technique would have to be made available to FRA upon request.

All commenters supported RSPA's proposed inspection and test requirement for tank cars with linings and coatings. RPI suggested that RSPA should specify ''owners of linings and coatings,'' as opposed to the ''tank car owner,'' to determine the inspection and test technique and interval—since most shippers own the tank car lining or coating as opposed to the tank car owner. Mobil Oil Corporation and others suggested that the regulation should only apply to linings and coatings installed to protect the tank shell, as opposed to those applied for lading integrity or quality.

RSPA and FRA agree with RPI and are revising the proposed requirements to incorporate RPI's suggestions. In this final rule, owners of linings and coatings in tank cars must determine the

periodic inspection interval and inspection technique for the lining and coating, based on the owner's knowledge of the material used. This will ensure that the lining or coating is in proper condition for the transportation of hazardous materials. The owner must also maintain all supporting documentation used to make such a determination, such as the lining or coating manufacturer's recommended inspection interval and inspection technique, at the owner's principle place of business. The supporting documentation used to make such inspection interval determinations and the inspection technique must be made available to FRA upon request.

Further, in § 180.509, RSPA is revising paragraphs (c)(3)(i) and (iii)(A) to require an inspection and test of the lining or coating *only when the lining or coating is applied to protect the tank shell* from a lading such as hydrochloric acid.

K. Safety System Inspections

In the NPRM, RSPA proposed to add explicit requirements for the inspection of thermal protection systems, tank head puncture resistance systems, coupler vertical restraint systems, and devices used to protect discontinuities. If, after an inspection, one or more of these systems do not conform to the applicable specification requirements contained in Part 179, renewal or repair of the system is necessary to continue the qualification of the tank car. RSPA received two comments on this proposal, both indicating support.

In this final rule, RSPA is adopting the requirements for the inspection of these safety systems.

L. Quality Assurance Program (QAP)

In the NPRM, RSPA proposed to require that each tank car facility establish a Quality Assurance Program (QAP) to detect non-conformities during the manufacturing, repair, or inspection and test process. A tank car facility means an entity that manufactures, repairs, inspects, or tests tank cars to ensure that the tank cars conform to Parts 179 and 180, that alters the certificate of construction of the tank car, or that verifies that the tank car conforms to the specification.

All commenters endorsed the QAP proposal; however, several commenters suggested that RSPA delay the effective date for at least 18 months so that tank car repair facilities will have the opportunity to develop a QAP. In its comments, AAR supported RSPA's QAP requirements and further stated that the QAP developed by RSPA is consistent with AAR's quality assurance requirements.

Several commenters asked RSPA to clarify whether or not a tank car facility includes a shipper's loading facility where items such as gaskets and manway bolts are normally inspected and replaced as part of a ''pre-trip'' inspection. It is not the intention of RSPA to include within the definition of a tank car facility a shipper's facility where pre-trip inspections are performed. Generally, a tank car facility evaluates the tank structure to ensure that, if serious fatigue, corrosion, or accidental damage occurs within the inspection and test interval, the remaining structure can withstand reasonable loads without failure or excessive structural deformation. A shipper, on the other hand, ensures by inspection that the tank is in proper condition for transportation from point of origin to destination.

Based on the comments received, RSPA is requiring each tank car repair facility to develop a QAP that has the means to detect any nonconformity in the manufacturing, maintenance, or repair process and that has the means to prevent its recurrence. Furthermore, the QAP must ensure that the finished product conforms to the requirements of the applicable specification and the regulations in the HMR. RSPA is also clarifying the definition of a tank car facility to mean an entity that manufactures, repairs, inspects, or tests tank cars to ensure that the tank cars conform to Parts 179 and 180, that alters the certificate of construction of the tank car, that ensures the continuing qualification of a tank car by performing a function prescribed in Parts 179 or 180, or that makes any representation indicating compliance with one or more of the requirements of Parts 179 or 180. This language mirrors that for the qualification of highway cargo tanks (*see* § 180.2). A shipper that inspects a tank car solely to ensure that the tank car is safe for transportation is not performing a periodic qualification function. On the other hand, a shipper who continues the qualification of a tank car, by performing a function described in Parts 179 or 180, meets the definition of a tank car facility.

M. Inspection Requirements Prior to Transportation

The current regulations, at § 173.31(b)(3), require that the shipper inspect a tank car before releasing it into transportation to ensure that, among other things, the closures are in a ''tool-tight,'' secure condition. Further, closures on the tank (under § 173.24(f)(1)(ii)) must be so designed and closed that ''under conditions (including the effects of temperature and vibration) normally incident to transportation . . . the closure is secure and leakproof.''

RSPA and FRA proposed in § 174.68 that tank cars be inspected prior to transportation as an amendment to the current requirements because of their concerns about tank cars in transportation with loose closures. Since 1989, FRA inspectors have found loose closures on tank cars containing hazardous materials more than 23,000 times. In that same period, RSPA has received about 1,100 to 1,200 incident reports each year on tank cars that had released product, often as a result of a loose closure. Those releases resulted in injury to 85 railroad employees. This history shows that more needs to be done to ensure that tank cars conform to the regulations when offered for transportation. It is FRA's experience that properly designed and secured closures (closures meeting the standards of §§ 173.24 and 173.31) do not become loose during transportation and that most of the incidents reported to RSPA reflect poor pre-trip preparation of the tank car prior to offering it for transportation. In order to clearly state the offerors responsibility for pre-trip inspection of a tank car, § 174.68 in the NPRM proposed a rebuttable presumption against a proper pre-trip inspection if unsecured closures were found in transit.

RSPA and FRA believe that aligning the inspection requirements in current § 173.31(b) with the design and operations requirements in § 173.24 will clarify their full intent, foster compliance with safety standards, and improve hazardous materials transportation safety. Comments on the proposed § 174.68 came from most of those filing responses to the NPRM and they covered five aspects of the proposal. First, several commenters argued that § 174.68 was the wrong place for pre-trip inspection requirements, that, as shipper responsibilities, they belonged in Part 173. RSPA and FRA agree and the final rule includes pre-trip inspection in § 173.31.

Second, several commenters said that the proposal raised the duty of care for pre-trip car preparation to an all but impossible level. Current § 173.31(b)(1) requires that ''the shipper must determine *to the extent practicable*, that . . . fittings are in proper condition. . . .'' [emphasis added] The origin of the phrase ''to the extent practicable'' in § 173.31(b) has its roots in the Interstate Commerce Commission's (ICC) regulations prior to 1960. In those

regulations, the ICC required shippers, before loading the tank car, to examine the tank and each appurtenance to see that the safety and outlet valves, safety vents, the excess flow valves (if any), the closures of all openings, and the protective covers of all appurtenances were in proper condition.

In a letter dated July 10, 1959, to AAR, the Manufacturing Chemists' Association (MCA) stated that the addition of the words ''to the extent practicable'' in the tank car loading section was to clarify the purpose of the regulations and to make the regulation more realistic and to eliminate from the regulation items which were either very difficult to inspect or very expensive to inspect such as a full inspection of safety relief valves or excess flow valves. Read literally, the regulation at that time would impose a duty on the shipper to disassemble and inspect safety valves and excess flow valves prior to each trip.

As a result of the MCA letter in 1959, AAR petitioned the ICC to amend the current regulations by inserting the phrase ''to the extent practicable'' in the tank car loading section. The ICC agreed and the new phrase went into the regulations on March 23, 1960, under Order Number 42. From the beginning, this phrase was meant to reflect the practical impossibility of, for instance, taking the valves apart before each trip; the additional language was not intended to excuse poor pre-trip preparation. This final rule does not enlarge the ''to the extent practicable'' standard.

Third, several commenters seemed to confuse the essential elements of the loose closure violation by arguing that evidence of a leak (or release of product) in transit does not necessarily prove the lack of a pre-trip inspection. They mistakenly believed that the proposal focused on *releases* of hazardous materials rather than the broader fault: *loose fittings and closures*. FRA and RSPA agree that leaks can develop in transit from sources other that insecure closures, the failure of a rubber lining and the failure of a frangible disc are two possible examples. This provision was developed from the requirement in the current § 173.31(b) that closures must be secured in place with an appropriate tool, and the final rule makes no changes in that requirement.

Fourth, many commenters argued that the condition of tank cars in transit is the responsibility of the railroads, that it is their duty to ensure that the closures are, and remain, tight. RSPA and FRA note that current § 173.31(b)(3) requires the shipper to make closures ''tool tight'' prior to shipping and that § 173.24(b) and (f) require closures to be designed, maintained, and closed so that ''under conditions (including the effects of temperature and vibration) normally incident to transportation'' they will remain secure. Responsibility for tight closures must rest primarily with the offeror. The railroads' duty to inspect a tank car is aimed at detecting obvious leaks and defects in the running gear of the vehicle. FRA's pre-departure inspection requirements—applicable to all trains whether or not carrying hazardous materials—are found at 49 CFR 215.13. Appendix D to Part 215 describes the inspection to be performed by a train crew, ''At each location where a freight car is placed in a train and [designated inspectors] are not on duty. . . .'' Appendix D requires the train crew to reject a placarded hazardous materials tank car from which lading is leaking. As the National Industrial Transportation League said in its comments, ''The key issue in determining the regulatory responsibilities under the HMR should be to determine which functions parties actually performed, or should have performed.'' This final rule is not intended to, nor does it, change these essential relationships.

Fifth, several commenters argued that the proposed rebuttable presumption will be impossible to meet. The proposed rule states examples (derailment and vandalism) that will rebut the presumption, but they are not intended to be exclusive. In FRA's experience in discussing alleged violations with shippers over the past few years, the following circumstances have led to either termination or a penalty amount significantly reduced from that originally proposed, depending on the facts and circumstances of each case:

- Delivery to a mistaken destination and subsequent rerouting to the original destination,
- Erroneous spotting at a repair facility,
- Actual delivery to the consignee prior to inspection,
- Abnormally rough handling by a railroad,
- Gaskets, otherwise secure at the start of the trip, deteriorating enroute in a manner the offeror could not have foreseen.

One commenter cited case law on irrebuttable presumptions. RSPA and FRA agree with the commenter that a presumption impossible to rebut would not be proper; for the reasons given, RSPA and FRA do not view the presumption in the regulation published today as impossible to rebut.

In some cases, FRA has seen pre-trip inspection check lists that were at obvious odds with the conditions discovered on the car. The rebuttable presumption stated today is not designed to make enforcement ''easier,'' it is designed to make responsibility more certain. For most shippers of hazardous materials, today's rule will not mean a change in the regulator/regulated relationship.

When FRA issues a Notice of Proposed Violation for an alleged violation of the HMR, the respondent (railroad, shipper, or manufacturer) is afforded the opportunity to investigate the charges and to collect factual evidence to mitigate or dismiss the case. Respondent has the opportunity for a hearing. FRA, or an Administrative Law Judge, considers respondent's submissions, together with the factors in 49 U.S.C. § 5123(c), before reaching a decision. The standard in this final rule does not change the process by which FRA enforces railroad related hazardous materials violations. FRA expects that, by clarifying the responsibility of the shipper, there will be fewer loose closures on tank cars and fewer injured railroad employees.

Several commenters mentioned mishandling, even abusive handling, by the railroads. FRA's own studies have demonstrated that overspeed impacts in railroad switching operations are far from a rarity, but FRA is not aware that overspeed impacts will loosen the threaded fasteners securing lading retention fittings on a tank car. Overspeed impacts can cause severe structural damage, lessen the service life of the car, and cause frangible safety vent discs to rupture. In such cases, enforcement actions against the railroads are appropriate, and FRA pursues them. One shipper, PPG Industries, Inc., put impact recorders on a test fleet of 50 tank cars operated out of its Lake Charles, Louisiana plant. The impacts in excess of 6G's (about 8 miles per hour) between July 1992 and December 1993 are documented in PPG's comments in this docket. Because they are limited in geographic scope, RSPA and FRA cannot say that this data presents a typical picture, nation-wide, but PPG's charts are graphic evidence, arranged by railroad and by terminal, that railroad tank cars are subject to stresses well above their optimum operating environment.

In the final rule, RSPA is articulating a rebuttable presumption standard aimed specifically at loose closures on tank cars. The statement of this presumption in § 173.31(d)(2) does not mean, however, that there is a different standard for railroad tank cars than for

other packagings used to transport hazardous materials. The ''secure and leakproof'' standard established in § 173.24(f) applies to closures on all packagings used for transportation. If a hazardous materials package is discovered with loose closures, either the closures were not designed properly or they were not tightened properly. Neither RSPA nor FRA are aware of hazardous materials packagings designs that allow closures to loosen in transit. Hence the presumption that, when an inspector discovers a loose closure, it was not tightened properly. RSPA has made the presumption explicit for railroad transportation because FRA's enforcement experience, discussed earlier, proves the need to focus responsibility on those who prepare hazardous materials for transportation.

The following table lists the adopted paragraphs or sections and, where applicable, the corresponding paragraph or section contained in the current HMR. In some cases, the cross-references are to provisions which are similar to, but not identical with current provisions.

New section	Old section
173.31(a)(2)	173.31(a)(4) [except 4th and 5th sentence].
173.31(a)(3)	
173.31(a)(4)	173.31(a)(7) [1st sentence after ''Effective July 1, 1991...'' and preceding ''..., as in effect on November 16, 1990''].
173.31(a)(5)	
173.31(a)(6)	173.31(a)(3) [1st sentence].
	173.31(a)(3)(i).
173.31(b)(1)	173.31(a)(5) [except last sentence].
173.31(b)(2)	173.31(a)(12).
	173.31(a)(15) [1st sentence preceding ''...nonreclosing pressure relief devices.''] [2nd preceding ''...provided that the liquid...''] [3rd sentence preceding ''...breather holes are not...''].
173.31(b)(3)	
173.31(b)(4)	
173.31(b)(5)	
173.31(b)(6)	
173.31(c)	173.31(a)(14) [1st sentence preceding ''...equal to or greater than...''].
	173.31(a)(14)(i) [1st sentence preceding ''...ullage space or dome of tank.''].
	173.31(a)(14)(ii).
	173.31(a)(14)(iii).
173.31(d)(1)	
173.31(e)(1)	173.31(a)(17).
173.31(e)(2)	
173.31(f)	
173.314(c), Note 2	173.314(c), Note 25.
173.314(c), Note 3	173.314(c), Note 21.
173.314(c), Note 4	173.314(c), Note 20.
173.314(c), Note 6	173.314(c), Note 12 [except 1st and last sentence].
173.314(c), Note 7	173.314(c), Note 18 [1st sentence preceding ''...g, when offered for transportation.''].
173.314(c), Note 8	173.314(c), Note 19 [1st sentence preceding ''...g, when offered for transportation.''].
179.7	
179.16	179.100–5.
179.18	179.100–4.
179.20	
179.22	179.100–21.
	179.105–8.
	179.200–25.
	179.203–3.
Appendix A to Part 179	179.105–5 (b) and (c).
Appendix B to Part 179	179.105–4 (d) and (e).
Subpart F to Part 180	
180.501	
180.503	
180.505	
180.507	
180.509	
180.511	
180.513	
180.515	
180.517	
180.519	

IV. Review by Section Summary

Part 171

Section 171.7(a)(3). The 49 CFR reference sections for the Association of American Railroads standards and for a Compressed Gas Association standard are added, revised or removed, as appropriate, to reflect the changes in this rulemaking.

Part 172

Section 172.101. In the HMT, three special provisions are removed. Special Provision ''B41,'' appearing in column (7) of the entries for benzyl chloride, fluorosulfonic acid, and titanium tetrachloride is no longer necessary due to the new inspection and test intervals adopted in this final rule. Special Provision ''B43,'' appearing in column (7) of the entries for carbon dioxide, refrigerated liquid, hydrogen chloride, refrigerated liquid, and vinyl fluoride,

inhibited, also is no longer necessary because of the new inspection and test requirements. For the Division 2.1 (flammable gas) entries ethyl chloride and ethyl methyl ether, Special Provision ''B63'' is removed, thus prohibiting the use of tank cars without head protection or thermal protection.

Section 172.102. As discussed above, Special Provisions ''B41'' and ''B43'' are removed. The inspection and test intervals (i.e., 5–3–1) specified in Special Provision ''B41'' and the nondestructive test requirements specified in Special Provision ''B43'' are incorporated into Subpart F of Part 180. Special Provision ''B63'' appears only in the entries ethyl chloride and ethyl methyl ether and, therefore, in paragraph (c), is removed. Special Provision ''B64'' is amended by changing the head-protection section reference ''§ 179.105–5'' to read ''§ 179.16,'' and Special Provision ''B79'' is amended by changing the head- and thermal-protection section references ''§§ 179.105–4 and 179.105–5'' to read ''§ 179.16 and 179.18''.

Part 173

Section 173.31. The section heading is revised to read ''Use of Tank Cars.'' This section also is completely revised and reorganized for clarity.

New paragraph (a)(1) corresponds to the language in the HMR for cargo tanks and portable tanks (*see* §§ 173.32c(a) and 173.33(a)). The section also includes reference to certain ''AAR'' specification tank cars that are authorized for hazardous materials service in the HMR (*see* §§ 173.241 and 173.242). When these tank cars are used for the transportation of hazardous materials, the tank cars must meet the minimum specification for new construction as required by AAR.

New paragraph (a)(2) is essentially current § 173.31(a)(4). The first, second, and third sentences are revised to clarify the use of the term ''authorized.'' Prior to December 19, 1957 (ICC Order No. 33), the regulations stated that:

> [T]ank cars and appurtenances may be used for the transportation of any commodity for which they are authorized, as indicated on the certificate of construction. When a car is to be used for the transportation of a commodity other than those approved on the certificate of construction, it must be approved for such loading by the A.A.R. Tank Car Committee. Changes in fittings or commodity stencilling required to transfer a car from one service to another as authorized on the certificate of construction, may be made only be the owner or owner's authorized agent * * *.

As evidenced by the language above, the term ''authorized'' means those commodities designated on the certificate of construction and approved by the AAR Tank Car Committee. Order No. 33 changed the regulation by removing the phrase ''as indicated on the certificate of construction'' because many car owners did not have a certificate for older Class ARA-II (built prior to 1917), ARA-III (built prior to 1927), and some ICC–103 (built after 1927) tank cars. Because this final rule requires that the original and subsequent tank car certificates must be maintained for the life of the car and transferred with ownership, RSPA is clarifying the purpose of this paragraph by inserting the phrase ''in this part and specified on its certificate of construction'' at the end of the first sentence. See § 180.517. The second and third sentences are modified accordingly. Provisions contained in the fourth and fifth sentences of current § 173.31(a)(4), stating that DOT 105A-W, 109A-W, 111A100W4, 112A-W, and 114A-W tank cars may be used for any commodity for which it is approved and may be stencilled accordingly, and that a tank car stencilled to indicate that it is authorized for one commodity may not be used for any other service, are removed. The stencilling requirement for these cars is optional and, therefore, not enforceable.

New paragraph (a)(3) provides that no person may fill a tank car with a hazardous material when the tank car is overdue for periodic inspection and test. This provision allows the movement of tank cars containing hazardous material residue to a tank car facility for inspection and testing.

New paragraph (a)(4) is current § 173.31(a)(7). It removes reference to a compliance date, now past, and establishes that air brake equipment support attachments must be welded to pads instead of directly to the tank shell in conformance with §§ 179.100–16 and 179.200–19.

New paragraph (a)(5) prohibits the use of an internal self-energized manway that is located below the liquid level of the lading on a tank car, beginning on the effective date of this final rule. After the effective date of this final rule, an exemption would be required in order to continue to operate such a tank car. This provision was proposed paragraph (a)(22) in HM–175A.

New paragraph (a)(6) is current § 173.31(a)(3). It removes specific ''DOT'' class references and explains that any tank car of the same class with a higher tank test pressure than the tank car authorized in the HMR may be used. The paragraph is also simplified by specifying the hierarchy of the letters in the specification marking that describe special protective systems (e.g., ''J'' for thermally protected, jacketed cars; ''T'' for thermally protected, non-jacketed cars; ''S'' for cars with head shields but without thermal protection; and ''A'' for cars without protective systems).

New paragraph (b)(1), concerning the use of coupler vertical restraint systems, is current § 173.31(a)(5). It is revised to require all DOT specification tank cars and any other tank car used to transport hazardous material to be equipped with a coupler vertical restraint system. This revision also removes reference to a compliance date, now past, excepting DOT specification tank cars in nonhazardous materials service from being equipped with a coupler vertical restraint system.

New paragraph (b)(2), concerning pressure relief devices, is current §§ 173.31(a)(12) and 173.31(a)(15). This revision is simplified by using the term ''poisonous by inhalation'' (see § 171.8) in place of the defining criteria.

New paragraph (b)(3) requires head protection for all tank cars transporting Class 2 materials and tank cars constructed from aluminum or nickel plate. Tank cars currently equipped with half-head protection are excluded. The compliance period is 10 years from the effective date of this rule, except for class DOT 105 tank cars with less than 70 kl (18,500 gallon) capacity when used to transport a Division 2.1 material, which have a compliance period of 5 years. This provision was proposed paragraph (a)(19) in HM–175A.

New paragraph (b)(4) requires tank cars transporting Class 2 materials to have thermal protection. Exceptions from the thermal protection standard are granted for ''chlorine,'' ''carbon dioxide, refrigerated liquid,'' and ''nitrous oxide, refrigerated liquid,'' and for tank car tank classes DOT 106, 107A, 110, and 113. This provision was proposed paragraph (a)(20) in HM–175A. In the NPRM, RSPA did not propose thermal protection for the commodities identified above (see proposed § 173.314(k) and (o)). The compliance period is 10 years from the effective date of this final rule.

New paragraph (b)(5) requires bottom-discontinuity protection for all existing tank cars transporting a hazardous material. The new protection requirements conform to paragraphs E9.00 and E10.00 of the AAR Specifications for Tank Cars, M–1002. Existing tank cars that conform to Appendix Y of the AAR Specifications for Tank Cars, M–1002, may continue in use. The compliance period is 10 years from the effective date of this final rule.

This provision was proposed paragraph (a)(23) in HM–175A.

New paragraph (b)(6) is added to require tank car owners to implement measures to ensure the phased-in completion of the modifications on each tank car subject to this final rule. As discussed earlier in this preamble, RSPA and FRA have several programs in place to improve the tank car fleet. Owners, therefore, should develop careful plans, procedures, and schedules to assure completion of the modifications before the regulatory compliance date. Paragraph (b)(6) also requires submission of a yearly progress report to FRA that shows the reporting mark of each tank car requiring modification, the type of modification required for each tank car during the previous year, and the total number of tank cars modified the previous year.

New paragraph (c) was proposed as paragraph (d) in HM–201. This final rule revises the terms ''un-insulated'' to ''non-insulated,'' ''ullage space or dome'' to ''vacant,'' and clarifies that this provision applies to cars in hazardous materials service only. A new provision is added in paragraph (c)(3) to require all tank cars transporting a PIH material to have a tank test pressure of at least 20.7 Bar (300 psi). This provision is consistent with other regulations adopted under Docket HM–181 for PIH liquids.[19] Also, several shipping names appearing in the opening paragraph are revised for consistency with the proper shipping name as shown in the § 172.101 table.

New paragraph (d) reinforces the inspection requirements that must be fulfilled before a tank car of hazardous materials is offered for transportation. These provisions were proposed paragraph (a)(4) and § 174.68 in HM–201. These proposed requirements were revised and combined based on suggestions made by the commenters.

In new paragraph (e), to clarify that the paragraph applies to materials that are poisonous by inhalation, the paragraph heading is revised to read ''Special requirements for materials poisonous by inhalation.''

New paragraph (e)(1) concerns the use of heater coils. This provision is essentially current paragraph § 173.31(a)(17). This provision was proposed paragraph (e) in HM–201.

[19] For further information see *Performance-Oriented Packaging*, Docket HM–181, 55 FR 52402 (December 21, 1990). In general, liquid materials PIH in Hazard Zone A are assigned Special Provision B72 and those in Hazard Zone B are assigned Special Provision B74. These two special provisions require the use of a 105S, 112J, or a 114J tank car having a tank test pressure greater than 18 Bar (300 psi).

New paragraph (e)(2) requires that tank cars used for materials poisonous by inhalation must conform to at least a DOT 105S300W, 105S300ALW, 112J340W, or 114J340W. This provision was proposed paragraph (a)(21) in HM–175A. It is made consistent with Special Provision B74 for liquid PIH materials in Zone B. The compliance period is 10 years from the effective date of this final rule.

New paragraph (f) requires the use of a DOT 105S200W; a DOT 112S200W with an 11-gauge steel jacket conforming to § 179.100–4; a DOT 112S340W; or a DOT 112S200W tank car constructed from AAR steel specification TC–128, normalized, for the transportation of certain listed hazardous substances in § 173.31(f) that pose a potential threat to human health and the environment. This provision was proposed paragraph (a)(24) in HM–175A.

Section 173.314. In the table in paragraph (c), the entries are amended by removing references to the individual tank car *specifications* and adding references to the authorized tank car *classes*. This change ensures that § 173.314 does not authorize a tank car having a tank test pressure below the regulatory minimum in § 173.31(c). The current notes following the table are amended by redesignating, revising, or removing all tank car ''design requirements'' as follows (notes that apply to filling limits are retained):

Note 1, no change.

Note 2 is restated without substantial change and moved to § 173.314(n).

Note 3 and *Note 4* are restated without substantial change and moved to § 173.314(j), which is applicable to all materials having a primary or secondary Division 2.1 (flammable gas) hazard.

Note 5 is restated without substantial change for clarity.

Note 6 is restated without substantial change and moved to § 173.314(o).

Note 7, which restricts the transportation of multi-unit tank cars tanks (ton containers) to rail and highway only, is removed. RSPA believes no valid reason exists to restrict the transport of these units by water. A provision restricting the transport of multi-unit tank car tanks by air is unnecessary because all multi-unit tank car tanks exceed the maximum quantity limitations allowed by air.

Note 8 is restated without substantial change and moved to § 173.314(l).

Note 9 is moved to § 173.314(j) and made applicable to all materials with a primary or secondary Division 2.1 (flammable gas) hazard.

Note 10 is restated without substantial change and moved to § 173.314(m).

Note 11 is restated without substantial change and included in § 173.314(m).

Note 12 is restated without substantial change. The filling density requirements are moved to Note 6, and the design requirements are moved to § 173.314(k).

Note 13 is removed to eliminate duplication of the marking requirements prescribed in Special Provision B12, §§ 173.314(a)(5) and 172.330(a)(1)(i).

Note 14 is removed because it is not referenced in the table.

Note 15 is removed since it is included with the other design requirements applicable to tank cars used for materials having a primary or secondary Division 2.1 (flammable gas) hazard in § 173.314(j).

Note 16, which is currently reserved, is removed.

Note 17, which references § 173.314(g) is removed.

Note 18 is restated without substantial change and moved to Note 7.

Note 19 is restated without substantial change and moved to Note 8.

Note 20 is restated without substantial change and moved to Note 4.

Note 21 is restated without substantial change and moved to Note 3.

Note 22, referencing the requirements in § 173.245, is incorporated into the table under the entry ''Division 2.3, Zone A materials.''

Note 23 and *Note 24* are removed based on other changes in this final rule concerning the elimination of grandfather provisions.

Note 25 is restated without substantial change and moved to Note 2.

Note 29 and *Note 30* are removed based on other changes in this final rule concerning the elimination of grandfather provisions.

In addition, the table in § 173.314(c) will reflect the tank car classes and not the specifications.

Section 173.319. Paragraph (a)(4)(iii) is revised by removing a parenthetical reference to current § 173.31(c)(13). A requirement contained in § 173.31(c)(13) prescribing special retest requirements for class DOT–113 tank cars is revised and moved to new paragraph § 173.319(e).

Section 173.323. Paragraph (c)(1) is revised to require a tank test pressure of at least 20.7 Bar (300 psi) for ethylene oxide no later then 10 years after the effective date of this final rule. Authorization for the use of a DOT 111A100W4 and 111J100W4 tank car is removed.

Part 179

Section 179.1. In paragraph (c), the section reference ''§ 173.31'' is revised to read ''§ 180.507''.

Section 179.2. This section is amended by adding a definition for ''Tank car facility.''

Section 179.7. This section requires tank car facilities to have a Quality Assurance Program (QAP). Paragraph (a) sets forth performance standard for the program. Paragraphs (b)(1) through (b)(13) require that the QAP have certain minimum requirements. The term ''Enhanced visual imagery'' in paragraph (b)(10) is changed to read ''Optically-aided visual inspection'' to correctly identify that the visual inspection method is ''optically aided.'' Optically-aided visual methods include the use of magnifiers, borescopes, fiberscopes, and machine vision technology (e.g., a video digitizer that converts images into digital form, and through image enhancement, image segmentation, and feature extraction, the computer classifies objects within the image). Paragraph (c) requires tank car facilities to ensure that only personnel qualified to perform a particular nondestructive inspection and test perform that operation. Paragraph (d) requires each tank car facility to have written procedures, covering inspection, fabrication, and repair operations as appropriate, for their employees. Paragraph (e) cross-references the training requirements in Subpart H of Part 172. (Section 172.702 requires that a hazmat employer train each of its hazmat employees.) Paragraph (f) specifies the compliance date by which tank car facilities must have a QAP and written procedures in effect.

Section 179.16. This new section contains the tank-head puncture-resistance requirements found in current §§ 179.100–23 and 179.105–5.

Section 179.18. This new section contains the thermal protection requirements found in current § 179.105–4(a), (b), and (c). A requirement that the exterior of the tank car must be painted white in proposed § 179.18(d) is moved to § 179.101–1, Note 4 in this final rule. Editorial revisions are made to these requirements for clarity and for consistency with other changes in this final rule.

Section 179.20. This new section contains bottom-discontinuity protection requirements. For new tank cars, bottom-discontinuity protection must conform to paragraphs E9.00 and E10.00 of the AAR Specifications for Tank Cars, M–1002.

Section 179.22. New section 179.22 consolidates the marking requirements contained in current §§ 179.100–21, 179.105–8, 179.200–25, and 179.203–3. Based on this consolidation, §§ 179.100–21, 179.105–8, 179.200–25, and 179.203–3 are removed.

Section 179.100–4. This section is amended by removing the phrase ''except that a protective coating is not required when foam-in-place insulation that adheres to the tank or jacket is applied'' at the end of the first paragraph. This change is based on an AAR petition (P–1050) to require protective coatings on the outside surface of the tank shell and the inside surface of the jacket.

Section 179.100–21. The marking requirements contained in this section are consolidated with other marking requirements in new § 179.22 and, as discussed earlier, § 179.100–21 is removed.

Section 179.100–23. The head protection requirements contained in this section are moved to § 179.16(b), and, as discussed earlier, § 179.100–23 is removed.

Section 179.101–1. Certain editorial changes are made in § 179.101–1, Note 4, for clarity and consistency with other changes made in this final rule. In the first sentence in Note 4, the section reference ''§ 179.100–4,'' which addresses insulated tank cars, is removed because Note 4 applies to non-insulated cars only. Note 4 is revised to clarify that there is no need to paint the tank white when a ''thermal protection'' system is applied (consistent with current § 179.105–4(g) and proposed § 179.16 (d)), and to remove a requirement that tank cars in hydrogen fluoride service need to have a dark colored band in the top platform and fitting area because hydrogen fluoride is not a Class 2 (compressed gas) material. The last sentence is also removed because it is not a mandatory requirement.

Section 179.103–1. Current paragraph (c), providing that a manway may be located other than at the top of the tank is no longer valid and, therefore, is removed and reserved.

Section 179.103–2. Current paragraph (a) containing manway cover plate requirements is revised by removing the phrase ''may be of the self-energizing type and''. This change would prohibit the construction of tank cars with a self-energized manway located below the liquid level of the lading.

Section 179.103–5. In current paragraph (a)(1), the first two sentences authorizing the location of a self-energizing manway below the liquid level of the tank is no longer valid and, therefore are removed.

Section 179.105. Current §§ 179.105 through 179.105–8 containing special requirements for class DOT 105S, 105J, 111J, 112S, 112J, 112T, 114S, 114J, and 114T specification tank cars are removed because they are unnecessary. The applicable requirements concerning head protection and thermal protection are moved to §§ 179.16, 179.18, and Appendices A and B to Part 179, as appropriate. The marking requirements are consolidated into § 179.22. The requirement for exterior tank color was moved to footnote 4 of the § 179.101–1 table.

Section 179.200–4. This section is amended by removing the phrase ''except that a protective coating is not required when foam-in-place insulation that adheres to the tank or jacket is applied'' at the end of the first paragraph. This change is based on an AAR petition (P–1050) to require protective coatings on the outside surface of the tank shell and the inside surface of the jacket.

Section 179.200–25. The marking requirements contained in this section are consolidated with other marking requirements in § 179.22, and, as discussed earlier, § 179.200–25 is removed.

Section 179.200–27. The head protection requirements are consolidated into § 179.16. Therefore, current § 179.200–27 is removed.

Section 179.203. Current §§ 179.203, 179.203–1, 179.203–2, and 179.203–3 containing special requirements for class DOT 111 tank cars are unnecessary and are removed. The restriction in paragraph (c) against the use of class DOT 111 tank cars built after March 1, 1984, for the transportation of flammable gases or ethylene oxide is incorporated into §§ 173.314 and 173.323. The applicable head-protection and thermal-protection requirements are consolidated into §§ 179.16 and 179.18, respectively. The marking requirements are consolidated into § 179.22.

Appendix A. The tank-head puncture-resistance test verification requirements in § 179.105–5 paragraphs (b) and (c) are moved to this Appendix.

Appendix B. This appendix contains the thermal-protection test-verification requirements found in current § 179.105–4(d), (e) and (f). These requirements are editorially revised for clarity.

Part 180

Subpart F of Part 180. This subpart contains the qualification and maintenance requirements for tank cars.

Section 180.501. Paragraph (a) specifies the applicability of the Subpart. Paragraph (b) specifies that any person who performs a function required by Subpart F of Part 180 must perform that function according to the regulations.

Section 180.503. This section defines certain terms used throughout the subpart.

Section 180.505. This section requires each tank car facility performing repair work to have a QAP based on requirements in § 179.7 for new car construction.

Section 180.507. This section contains the continuing qualifications for existing tank cars that are no longer authorized for new construction, such as a class DOT 113A175W tank car. Paragraph (a) is essentially current § 173.31(a)(1) except that it is revised to include non-specification tank cars that are currently authorized for the transportation of hazardous materials. Paragraphs (b)(1), (2), (3), and (4) are current § 173.31(a)(2), (8), (9), and (10).

Section 180.509. This section specifies the requirements for the periodic inspection and testing of tank cars. Paragraph (a)(1) requires each tank car facility to evaluate the tank car according to the ''*Acceptable results of inspections and tests*'' as prescribed in § 180.511. Paragraph (a)(2) requires marking each tank car passing a periodic inspection and test to indicate the date it passed this review and the due dates for the next inspection and test required in the new § 180.515. Paragraph (a)(3) requires a written report for each tank car after it successfully passes an inspection and test. Paragraph (b) specifies unusual conditions that may require an inspection and test of tank cars. Paragraph (b)(1) requires an inspection and test if the tank shows evidence of abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other condition unsafe for transportation. Paragraph (b)(2) requires an inspection and test if the tank car was in an accident and damaged to the extent that may adversely affect its capability to retain its contents (e.g., large dent or gouge in the tank shell). Paragraph (b)(3) requires an inspection and test if the tank was involved in a fire. Paragraph (b)(4) requires an inspection and test of either a single tank car or a design of tank cars operating in an unsafe condition, if required by FRA, based on the existence of a probable cause. Probable cause may include an inspection and test where FRA discovers a crack in a welded area, a wheel burn, or a large dent or bulge in the tank shell; it may also include a group of cars of a given design if FRA discovers problems apparently related to cars of that design.

Paragraph (c) specifies the frequency with which inspections and tests must be performed on tank cars. Paragraph (c)(1) specifies the requirements for the inspection and hydrostatic test of class DOT 107 tank cars and riveted tank cars. As noted above, the hydrostatic test is still effective for these tank cars since it will detect loose rivets and areas of metal distress. Paragraph (c)(2) requires an inspection for thermal integrity of class DOT 113 tank cars in place of the inspection and testing requirements in Subpart F of Part 180. This paragraph cross-references the requirements in § 173.319(e). Paragraph (c)(3) specifies the inspection and test requirements for fusion welded tank cars. The intervals would vary depending upon whether or not the tank car was lined or coated and upon whether or not the car was transporting materials corrosive to the tank. For linings and coatings, this final rule requires a tank car facility to inspect the lining or coating based on the inspection and test intervals and techniques established by the lining or coating owner. The owner must establish an inspection interval and test technique based on the manufacturer's recommendations or the owner's knowledge of the life-expectancy of the lining or coating.

Paragraph (d) specifies the manner for conducting a visual inspection for each tank car. Paragraph (d)(1) requires an inspection of the tank car internally and externally for abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other conditions unsafe for transportation. Paragraph (d)(2) requires the inspection of all piping, valves, fittings, and gaskets for corrosion and any other condition unsafe for transportation. Paragraph (d)(3) requires an inspection of the tank cars for missing or loose bolts, nuts, or other elements. Paragraph (d)(4) requires an inspection of all closures on the tank car for proper securement. The tank car facility would also inspect the protective housings for proper securement. Paragraph (d)(5) requires an inspection of the seats on excess flow valves. Paragraph (d)(6) requires an inspection of the markings on the tank car for legibility.

Paragraph (e) requires that a structural integrity inspection and test shall include all transverse fillet welds greater than 0.64 cm (0.25 inch) within four feet of the bottom longitudinal center line; the termination of longitudinal fillet welds greater than 0.64 cm (0.25 inch) within four feet of the bottom longitudinal center line; and all tank shell butt welds within two feet of the bottom longitudinal center line using one or more nondestructive test methods. The term ''Enhanced visual imagery'' is changed to read ''Optically-aided visual inspection'' to correctly identify that the visual inspection method is ''optically aided.''

Paragraph (f) requires thickness measurements to determine that the tank car is not below the minimum shell thickness.

Paragraph (g) specifies the allowable shell thickness reductions. Paragraph (g)(1)(i) allows thickness reductions on carbon steel, stainless steel, aluminum, nickel, and manganese-molybdenum steels. Paragraph (g)(1)(ii) specifies the minimum shell and head thickness reductions for uniform and localized areas and Note 5 of the table is removed to disallow any reduction in the shell thickness for class DOT 111A tank cars transporting ethylene oxide. As discussed earlier, this final rule prohibits the transportation of ethylene oxide in a class DOT 111 tank car.

Paragraph (h)(1) requires the inspection of the safety systems on the tank, such as thermal protection systems, tank-head puncture-resistance systems, and coupler vertical restraint systems, to ensure their integrity. Paragraph (h)(2) requires the inspection and test of re-closing pressure relief devices (safety valves).

Paragraph (i) requires an inspection and test of tank cars with a lining or coating on the tank car. The inspection interval is determined by the owner based on the type of testing technique used, and knowledge of the material and tank car, but cannot exceed 10 years.

Paragraph (j) requires a leakage pressure test of the tank car and appurtenances.

Paragraph (k) allows the use of an alternative inspection and test procedure provided the procedure is based on a damage-tolerance evaluation, examined by the AAR Tank Car Committee, and approved by the Associate Administrator for Safety FRA.

Paragraph (l) specifies the compliance date for the new inspection and test requirements.

Section 180.511. This section specifies the acceptable results of inspections and tests. Paragraph (a) establishes that an acceptable visual inspection as one that shows no structural defect that may cause the tank car to fail (including leak) before the next inspection and test interval.

Paragraph (b) establishes that an acceptable structural integrity inspection and test is one that shows no structural defect that may initiate cracks or propagate cracks and cause the tank car to fail before the next inspection and test interval.

Paragraph (c) establishes that an acceptable service life shell thickness is one that shows no areas of the tank car

below the minimum shell or head thickness allowed in § 180.509(g).

Paragraph (d) establishes that an acceptable safety system inspection is one that shows the systems (e.g., a thermal protection system) conform to Part 179.

Paragraph (e) establishes that an acceptable inspection and test for lining and coatings as one that shows no holes or degraded areas.

Paragraph (f) establishes that an acceptable inspection and test for a leakage pressure test as one that shows no indications of leakage in any product piping, fitting, or closure.

Paragraph (g) establishes that an acceptable hydrostatic test, for class DOT 107 tank cars and riveted tank cars, is one that shows no leakage or deformations (i.e., distress) in the tank.

Section 180.513. This section specifies that tank car repairs must conform to the requirements of Appendix R of AAR Specifications for Tank Cars. As proposed in HM–175A, the introductory text becomes paragraph (a), and § 173.31 paragraph (f)(3) becomes § 180.513 paragraph (b). Section 180.513(b) requires that, unless the exterior tank car shell or interior tank car jacket has a protective coating, when the complete tank car jacket is removed to effect a repair, the exterior tank car shell and the interior tank car jacket must have a protective coating applied to prevent the deterioration of the tank shell and tank jacket.

Section 180.515. This section specifies the marking requirements for tank cars after a successful tank inspection and test.

Section 180.517. This section specifies the reporting and record retention requirements after a tank car has successfully completed its required inspection and test. Paragraph (a) requires the tank car owner to retain the certificate of construction of the tank car (AAR Form 4–2) and related documentation certifying that the tank car conforms to the specification. The owner shall retain the documents for the period of ownership. Upon a change in ownership, Section 1.3.15 of AAR Specifications for Tank Cars requires the transfer of these documents to the new owner. Paragraph (b) specifies the inspection and test reporting requirements.

Section 180.519. This section specifies the periodic test and inspection requirements for multi-unit tank cars (e.g., class DOT 106 and 110 multi-unit tank cars).

V. Regulatory Analysis and Notices

A. Executive Order 12866 and DOT Regulatory Policies and Procedures

This final rule is considered a significant regulatory action under section 3(f) of Executive Order 12866 and was reviewed by the Office of Management and Budget. The rule is considered significant under the Regulatory policies and Procedures of the Department of Transportation (44 FR 11034) because it affects a significant segment of the tank car industry. A regulatory evaluation is available for review in the docket.

B. Executive Order 12612

This final rule has been analyzed in accordance with the principles and criteria contained in Executive Order 12612 (''Federalism''). Federal law expressly preempts State, local, and Indian tribe requirements applicable to the transportation of hazardous material that cover certain subjects and are not ''substantively the same'' as the Federal requirements. 49 U.S.C. 5125(b)(1). These covered subjects are:

(A) the designation, description, and classification of hazardous material;

(B) the packing, repacking, handling, labeling, marking, and placarding of hazardous material;

(C) the preparation, execution, and use of shipping documents related to hazardous material and requirements respecting the number, contents, and placement of those documents;

(D) the written notification, recording, and reporting of the unintentional release in transportation of hazardous material; or

(E) the design, manufacturing, fabricating, marking, maintenance, reconditioning, repairing, or testing of a packaging or a container which is represented, marked, certified, or sold as qualified for use in transporting hazardous material.

This final rule addresses the design, manufacturing, repairing, and other requirements for packages represented as qualified for use in the transportation of hazardous material. Therefore, this final rule preempts State, local, or Indian tribe requirements that are not ''substantively the same'' as Federal requirements on these subjects. Section 5125(b)(2) of Title 49 U.S.C. provides that when DOT issues a regulation concerning any of the covered subjects after November 16, 1990, DOT must determine and publish in the Federal Register the effective date of Federal preemption. The effective date may not be earlier that the 90th day following the date of issuance of the final rule and no later than two years after the date of issuance. RSPA has determined that the effective date of Federal preemption of this final rule will be 90 days after publication in the Federal Register.

Because RSPA lacks discretion in this area, preparation of a federalism assessment is not warranted.

C. Regulatory Flexibility Act

I certify that this final rule will not have a significant economic impact on a substantial number of small entities. The entities affected by the rule are involved in tank car leasing, maintenance, repair and use. There are no direct or indirect adverse economic impacts for small units of government, businesses, or other organizations.

D. Paperwork Reduction Act

The requirements for information collection have been approved by the Office of Management and Budget (OMB) under the provision of the Paperwork Reduction Act of 1980 (Pub. L. 95–511) under OMB control number 2137–0559.

E. Regulation Identifier Number (RIN)

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN numbers contained in the heading of this document can be used to cross-reference this action with the Unified Agenda.

List of Subjects

49 CFR Part 171

Exports, Hazardous materials transportation, Hazardous waste, Imports, Incorporation by reference, Reporting and recordkeeping requirements.

49 CFR Part 172

Hazardous materials transportation, Hazardous waste, Labels, Markings, Packaging and containers, Reporting and recordkeeping requirements.

49 CFR Part 173

Hazardous materials transportation, Incorporation by reference, Packaging and containers, Radioactive materials, Reporting and recordkeeping requirements, Uranium.

49 CFR Part 179

Hazardous materials transportation, Incorporation by reference, Railroad safety, Reporting and recordkeeping requirements.

49 CFR Part 180

Hazardous materials transportation, Incorporation by reference, Motor carriers, Motor vehicle safety, Packaging and containers, Railroad safety, Reporting and recordkeeping requirements.

In consideration of the foregoing, 49 CFR Chapter I is amended as follows:

PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS

1. The authority citation for part 171 continues to read as follows:

Authority: 49 U.S.C. 5101–5127; 49 CFR 1.53.

§ 171.7 [Amended]

2. In § 171.7, in paragraph (a)(3) Table, the following changes are made:

a. Under the *Association of American Railroads,* for the entry ''AAR Manual of Standards and Recommended Practices, Section C–Part III, Specifications for Tank Cars, Specification M–1002, September, 1992'' in column 2, the references are revised to read ''173.31; 174.63; 179.6; 179.7; 179.12; 179.16; 179.20; 179.22; 179.100; 179.101; 179.102; 179.103; 179.200; 179.201; 179.220; 179.300; 179.400; 180.509; 180.513; 180.515; 180.517.''.

b. Under the *Association of American Railroads,* for the entry ''AAR Specifications for Design, Fabrication and Construction of Freight Cars, Volume 1, 1988'' in column 2, the reference is revised to read ''179.16.''.

c. Under the *Compressed Gas Association, Inc.,* for the entry ''CGA Pamphlet C–6, Standards for Visual Inspection of Compressed Gas Cylinders, 1984'' in column 2, the reference is revised to read ''173.34; 180.519.''.

PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATIONS, EMERGENCY RESPONSE INFORMATION, AND TRAINING REQUIREMENTS

3. The authority citation for part 172 continues to read as follows:

Authority: 49 U.S.C. 5101–5127; 49 CFR 1.53.

§ 172.101 [Amended]

4. In § 172.101, in the Hazardous Materials Table, the following changes are made:

a. For the entries ''Benzyl chloride'', ''Fluorosulfonic acid'', and ''Titanium tetrachloride'', in Column (7), Special Provision ''B41,'' is removed.

b. For the entries ''Carbon dioxide, refrigerated liquid'' and ''Vinyl fluoride inhibited'', in Column (7), Special Provision ''B43'' is removed.

c. For the entry ''Hydrogen chloride, refrigerated liquid'', in Column (7), Special Provision '', B43'' is removed.

d. For the entry ''Ethyl methyl ether'', in column (7), Special Provision ''B63'' is removed.

e. For the entry ''Ethyl chloride'', in column (7), Special Provision ''B63,'' is removed.

§ 172.102 [Amended]

5. In § 172.102, in paragraph (c)(3), the following changes are made:

a. Special Provision ''B41'' is removed.

b. Special Provision ''B43'' is removed.

c. Special Provision ''B63'' is removed.

d. Special Provision ''B64'' is amended by revising the section reference ''§ 179.105–5'' to read ''§ 179.16''.

e. Special Provision ''B79'' is amended by revising the section references ''§§ 179.105–4 and 179.105–5'' to read ''§§ 179.16 and 179.18''.

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

6. The authority citation for part 173 continues to read as follows:

Authority: 49 U.S.C. 5101–5127; 49 CFR 1.53.

7. Section 173.31 is revised to read as follows:

§ 173.31 Use of tank cars.

(a) *General.* (1) No person may offer a hazardous material for transportation in a tank car unless the tank car meets the applicable specification and packaging requirements of this subchapter or, when this subchapter authorizes the use of an non-DOT specification tank car, the applicable specification to which the tank was constructed.

(2) Tank cars and appurtenances may be used for the transportation of any commodity for which they are authorized in this part and specified on the certificate of construction (AAR Form 4–2 or by addendum on Form R–1). See § 179.5 of this subchapter. Transfer of a tank car from one specified service on its certificate of construction to another may be made only by the owner or with the owner's authorization. A tank car proposed for a commodity service other than specified on its certificate of construction must be approved for such service by the AAR's Tank Car Committee.

(3) No person may fill a tank car overdue for periodic inspection with a hazardous material and then offer it for transportation. Any tank car marked as meeting a DOT specification and any non-specification tank car transporting a hazardous material must have a periodic inspection and test conforming to Subpart F of Part 180 of this subchapter.

(4) No railroad tank car, regardless of its construction date, may be used for the transportation in commerce of any hazardous material unless the air brake equipment support attachments of such tank car conform to the standards for attachments set forth in §§ 179.100–16 and 179.200–19 of this subchapter.

(5) No railroad tank car, regardless of its construction date, may be used for the transportation in commerce of any hazardous material with a self-energized manway located below the liquid level of the lading.

(6) Unless otherwise specifically provided in this part:

(i) When this subchapter designates a specific specification tank car, the same class tank car with a higher marked test pressure also may be used.

(ii) When the tank car specification delimiter is an ''A,'' offerors may also use tank cars with a delimiter ''S,'' ''J'' or ''T''.

(iii) When the tank car specification delimiter is an ''S,'' offerors may also use tank cars with a delimiter ''J'' or ''T''.

(iv) When a tank car specification delimiter is a ''T'' offerors may also use tank cars with a delimiter of ''J''.

(v) When a tank car specification delimiter is a ''J'', offerors may not use a tank car with any other specification delimiter.

(b) *Safety systems*—(1) *Coupler vertical restraint.* Each tank car conforming to a DOT specification and any other tank car used for transportation of a hazardous material must be equipped with a coupler vertical restraint system that meets the requirements of § 179.14 of this subchapter.

(2) *Pressure relief devices.* (i) Pressure relief devices on tank cars must conform to Part 179 of this subchapter.

(ii) Except for shipments of chloroprene, inhibited, in class DOT 115 tank cars, tank cars used for materials meeting the definition for Division 6.1 liquid, Packing Group I or II, Class 2 materials, or Class 3 or 4 liquids, must have self-closing pressure relief devices. However, a tank car built before January 1, 1991, and equipped with a non-closing pressure relief device may be used to transport a Division 6.1 or Class 4 liquid if the liquid is not poisonous by inhalation. Unless otherwise specifically provided in this

subchapter, frangible discs may not have breather holes.

(3) *Tank-head puncture-resistance requirements.* The following tank cars must have a tank-head puncture-resistance system that conforms to the requirements in § 179.16 of this subchapter, or to the corresponding requirements in effect at the time of installation:

(i) Tank cars transporting a Class 2 material.

(ii) Tank cars constructed from aluminum or nickel plate that are used to transport hazardous material.

(iii) Except as provided in paragraph (b)(3)(iv) of this section, tank cars not requiring a tank-head puncture-resistance system prior to July 1, 1996, must have a tank-head puncture-resistance system installed no later than July 1, 2006.

(iv) Class DOT 105A tank cars built prior to September 1, 1981, having a tank capacity less than 70 kl (18,500 gallons), and used to transport a Division 2.1 (flammable gas) material, must have a tank-head puncture-resistant system installed no later than July 1, 2001.

(4) *Thermal protection requirements.* The following tank cars must have thermal protection that conforms to the requirements of § 179.18 of this subchapter:

(i) Tank cars transporting a Class 2 material, except for class DOT 105A tank cars transporting chlorine, carbon dioxide refrigerated liquid, or nitrous oxide refrigerated liquid, and class DOT 106, 107A, 110, and 113 tank cars.

(ii) Tank cars not requiring thermal protection prior to July 1, 1996, must conform to this section no later than July 1, 2006.

(5) *Bottom-discontinuity protection requirements.* No person may offer for transportation a hazardous material in a tank car unless the tank car has bottom-discontinuity protection that conforms to the requirements of E9.00 and E10.00 of the AAR Specifications for Tank Cars. Tank cars not requiring bottom-discontinuity protection under the terms of Appendix Y of the AAR Specifications for Tank Cars as of July 1, 1996, must conform to these requirements no later than July 1, 2006. Tank cars modified before July 1, 1996, may conform to the bottom-discontinuity protection requirements of Appendix Y of the 1992 edition of the AAR Specifications for Tank Cars.

(6) *Scheduling of modifications and progress reporting.* The date of conformance for the continued use of tank cars subject to paragraphs (b)(3), (b)(4), (b)(5), (e)(2), and (f) of this section and §§ 173.314(j) and 173.323(c)(1) is subject to the following conditions and limitations.

(i) Each tank car owner shall modify, reassign, retire, or remove at least 50 percent of their in-service tank car fleet within the first half of the compliance period and the remainder of their in-service tank car fleet during the second half of the compliance period.

(ii) Before July 1 of each year, each owner shall submit to the Associate Administrator for Safety, FRA (Attention: RRS–12) a progress report that shows the reporting mark of each tank car, the status of each tank car during the previous year, and the total number of those tank cars modified reassigned, retired, or removed the previous year.

(c) *Tank car test pressure.* A tank car used for the transportation of a hazardous material must have a tank test pressure equal to or greater than the greatest of the following:

(1) Except for shipments of carbon dioxide, anhydrous hydrogen chloride, vinyl fluoride, ethylene, or hydrogen, 133 percent of the sum of lading vapor pressure at the reference temperature of 46 °C (115 °F) for non-insulated tank cars or 41 °C (105 °F) for insulated tank cars plus static head, plus gas padding pressure in the vacant space of a tank car;

(2) 133 percent of the maximum loading or unloading pressure, whichever is greater;

(3) 20.7 Bar (300 psi) for materials that are poisonous by inhalation;

(4) The minimum pressure prescribed by the specification in Part 179 of this subchapter; or

(5) The minimum test pressure prescribed for the specific hazardous material in the applicable packaging section in Subpart F or G of this Part.

(d) *Examination before shipping.* (1) No person may offer for transportation a tank car containing a hazardous material or a residue of a hazardous material unless that person determines that the tank car is in proper condition and safe for transportation. As a minimum, each person offering a tank car for transportation must perform an external visual inspection that includes:

(i) Except where insulation or a thermal protection system precludes an inspection, the tank shell and heads for abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other condition that makes the tank car unsafe for transportation;

(ii) The piping, valves, fittings, and gaskets for corrosion, damage, or any other condition that makes the tank car unsafe for transportation;

(iii) For missing or loose bolts, nuts, or elements that make the tank car unsafe for transportation;

(iv) All closures on tank cars and determine that the closures and all fastenings securing them are properly tightened in place by the use of a bar, wrench, or other suitable tool;

(v) Protective housings for proper securement;

(vi) The pressure relief device, including a careful inspection of the frangible disc in non-closing pressure relief devices, for corrosion or damage that may alter the intended operation of the device;

(vii) Each tell-tale indicator after filling and prior to transportation to ensure the integrity of the frangible disc;

(viii) The external thermal protection system, tank head puncture resistance system, coupler vertical restraint system, and other safety systems for conditions that make the tank car unsafe for transportation;

(ix) The required markings on the tank car for legibility; and

(x) The periodic inspection date markings to ensure that the inspection and test intervals are within the prescribed intervals.

(2) Closures on tank cars are required, under this subchapter, to be designed and closed so that under conditions normally incident to transportation, including the effects of temperature and vibration, there will be no identifiable release of a hazardous material to the environment. In any action brought to enforce this section, the lack of securement of any closure to a tool-tight condition, detected at any point, will establish a rebuttable presumption that a proper inspection was not performed by the offeror of the car. That presumption may be rebutted only by evidence establishing that the car was subjected to abnormal treatment, e.g., a derailment or vandalism.

(e) *Special requirements for materials poisonous by inhalation*—(1) *Interior heater coils.* Tank cars used for materials poisonous by inhalation may not have interior heater coils.

(2) *Tank car specifications.* Except as otherwise provided in this subchapter, tank cars used for materials poisonous by inhalation must conform to at least a DOT 105S300W, 105S300ALW, 112J340W, or 114J340W specification. Hazardous materials not requiring the use of a class DOT 105S300W, 105S300ALW, 112J340W, or 114J340W tank car prior to July 1, 1996, must be transported in one of these specifications no later than July 1, 2006.

(f) *Special requirements for hazardous substances.* (1) Before July 1, 2006, each tank car used for transportation of a

hazardous substance listed in paragraph (f)(2) of this section must conform to DOT 105S200W, DOT 112S200W with an 11-gauge steel jacket, DOT 112S340W, or DOT 112S200W constructed from AAR steel specification TC–128, normalized.

(2) *List of hazardous substances.* Hazardous substances for which the provisions of this paragraph (f) apply are as follows:

Aldrin
Allyl chloride
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC
Bis(2-chloroethyl) ether
Bromoform
Carbon tetrachloride
Chlordane
p-Chloroaniline
Chlorobenzene
Chlorobenzilate
p-Chloro-m-cresol
2-Chloroethyl vinyl ether
Chloroform
2-Chloronapthalene
o-Chlorophenol
3-Chloropropionitrile
DDE
DDT
1,2-Dibromo-3-chloropropane
m-Dichlorobenzene
o-Dichlorobenzene
p-Dichlorobenzene
3,3′-Dichlorobenzidine
1,4-Dichloro-2-butene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
Dichloroisopropyl ether
Dichloromethane @
2,4-Dichlorophenol
2,6-Dichlorophenol
1,2-Dichloropropane
1,3-Dichloropropene
Dieldrin
alpha-Endosulfan
beta-Endosulfan
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
Hexachlorophene
Hexachloropropene
Isodrin
Kepone
Methoxychlor
4,4′-Methylenebis(2-chloroaniline)
Methylene bromide
Pentachlorobenzene
Pentachloroethane
Pentachloronitrobenzene (PCNB)
Pentachlorophenol
Polychlorinated biphenyls (PCBs)
Pronamide
Silvex (2,4,5-TP)
2,4,5-T
TDE
1,2,4,5-Tetrachlorobenzene
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
Tetrachloroethane
Tetrachloroethylene
2,3,4,6-Tetrachlorophenol
Toxaphene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
Tris(2,3-dibromopropyl) phosphate

8. In § 173.314, the section heading and paragraph (c) are revised, and paragraphs (j) through (o) are added to read as follows:

§ 173.314 Compressed gases in tank cars and multi-unit tank cars.

* * * * *

(c) *Authorized gases, filling limits for tank cars.* A compressed gas in a tank car or a multi-unit tank car must be offered for transportation in accordance with § 173.31 and this section. The named gases must be loaded and offered for transportation in accordance with the following table:

Proper shipping name	Outage and filling limits (see note 1)	Authorized tank car class
Ammonia, anhydrous, or ammonia solutions > 50 percent ammonia	Note 2	105, 112, 114.
	Note 3	106.
Ammonia solutions with > 35 percent, but ≤ 50 percent ammonia by mass	Note 3	105, 109, 112, 114.
Argon, compressed	Note 4	107.
Boron trichloride	Note 3	105, 106.
Carbon dioxide, refrigerated liquid	Note 5	105.
Chlorine	Note 6	105.
	125	106.
Chlorine trifluoride	Note 3	106, 110.
Chlorine pentafluoride	Note 3	106, 110.
Dimethyl ether	Note 3	105, 106, 110.
Dimethylamine, anhydrous	Note 3	105, 106, 112.
Dinitrogen tetroxide, inhibited	Note 3	105, 106, 110.
Division 2.1 materials not specifically identified in this table	Note 3	105, 106, 110, 112, 114.
Division 2.2 materials not specifically identified in this table	Note 3	105, 106, 109, 110, 112, 114.
Division 2.3 Zone A materials not specifically identified in this table	None	See § 173.245.
Division 2.3 Zone B materials not specifically identified in this table	Note 3	105, 106, 110, 112, 114.
Division 2.3 Zone C materials not specifically identified in this table	Note 3	105, 106, 110, 112, 114.
Division 2.3 Zone D materials not specifically identified in this table	Note 3	105, 106, 109, 110, 112, 114.
Ethylamine	Note 3	105, 106, 110, 112, 114.
Helium, compressed	Note 4	107.
Hydrogen	Note 4	107.
Hydrogen chloride, refrigerated liquid	Note 7	105.
Hydrogen sulphide, liquified	68	106.
Methyl bromide	Note 3	105, 106.
Methyl chloride	Note 3	105, 106, 112.
Methyl mercaptan	Note 3	105, 106.
Methylamine, anhydrous	Note 3	105, 106, 112.
Nitrogen, compressed	Note 4	107.
Nitrosyl chloride	124	105.
	110	106.

Proper shipping name	Outage and filling limits (see note 1)	Authorized tank car class
Nitrous oxide, refrigerated liquid	Note 5	105.
Oxygen, compressed	Note 4	107.
Phosgene	Note 3	106.
Sulfur dioxide, liquified	125	105, 106, 110.
Sulfuryl fluoride	120	105.
Vinyl fluoride, inhibited	Note 8	105.

Notes:
1. The percent filling density for liquefied gases is hereby defined as the ratio of the mass of gas in the tank to the mass of water the tank will hold. For determining the water capacity of the tank in kilograms, the mass of one liter (0.264 gallons) of water at 15.55 °C (60 °F.) in air is 1 kg (2.204 pounds).
2. The liquefied gas must be so loaded so that the outage is at least two percent of the total capacity of the tank at the reference temperature of 46 °C (115 °F.) for non-insulated tanks and 41 °C (105 °F.) for insulated tanks.
3. The requirements of § 173.24b(a) apply.
4. The gas pressure at 54.44 °C (130 °F.) in any non-insulated tank car may not exceed 7/10 of the marked test pressure, except that a tank may be charged with helium to a pressure 10 percent in excess of the marked maximum gas pressure at 54.44 °C (130 °F.) of each tank.
5. The liquid portion of the gas at -17.77 °C (0 °F.) must not completely fill the tank.
6. The maximum permitted filling density is 125 percent. The quantity of chlorine loaded into a single unit-tank car may not be loaded in excess of the normal lading weights nor in excess of 81.65 Mg (90 tons).
7. 89 percent maximum to 80.1 percent minimum at a test pressure of 6.2 Bar (90 psi).
8. 59.6 percent maximum to 53.6 percent minimum at a test pressure of 7.2 Bar (105 psi).

* * * * *

(j) *Special requirements for materials having a primary or secondary Division 2.1 (flammable gas) hazard.* For single unit tank cars, interior pipes of loading and unloading valves, sampling devices, and gauging devices with an opening for the passage of the lading exceeding 1.52 mm (0.060 inch) diameter must be equipped with excess flow valves. For single unit tank cars constructed before January 1, 1972, gauging devices must conform to this paragraph by no later than July 1, 2006. The protective housing cover must be provided with an opening, with a weatherproof cover, above each safety relief valve that is concentric with the discharge of the safety relief valve and that has an area at least equal to the valve outlet area. Class DOT 109 tank cars and tank cars manufactured from aluminum or nickel plate are not authorized.

(k) *Special requirements for chlorine.* Tank cars built after September 30, 1991, must have an insulation system consisting of 5.08 cm (2 inches) glass fiber placed over 5.08 cm (2 inches) of ceramic fiber. Tank cars must have excess flow valves on the interior pipes of liquid discharge valves. Tank cars constructed to a DOT 105A500W specification may be marked as a DOT 105A300W specification with the size and type of safety relief valves required by the marked specification.

(l) *Special requirements for hydrogen sulphide.* Each multi-unit tank car must be equipped with adequate safety relief devices of the fusible plug type having a yield temperature not over 76.66 °C (170 °F.), and not less than 69.44 °C (157 °F.). Each device must be resistant to extrusion of the fusible alloy and leak tight at 55 °C (130 °F.). Each valve outlet must be sealed by a threaded solid plug. In addition, all valves must be protected by a metal cover.

(m) *Special requirements for nitrosyl chloride.* Single unit tank cars and their associated service equipment, such as venting, loading and unloading valves, and safety relief valves, must be made of metal or clad with a material that is not subject to rapid deterioration by the lading. Multi-unit tank car tanks must be nickel-clad and have safety relief devices incorporating a fusible plug having a yield temperature of 79.44 °C (175 °F.). Safety relief devices must be vapor tight at 54.44 °C (130 °F.).

(n) *Special requirements for hydrogen chloride.* Each tank car must be equipped with one or more safety relief devices. The discharge outlet for each safety relief device must be connected to a manifold having a non-obstructed discharge area of at least 1.5 times the total discharge area of the safety relief devices connected to the manifold. All manifolds must be connected to a single common header having a non-obstructed discharge pointing upward and extending above the top of the car. The header and the header outlet must each have a non-obstructed discharge area at least equal to the total discharge area of the manifolds connected to the header. The header outlet must be equipped with an ignition device that will instantly ignite any hydrogen discharged through the safety relief device.

(o) *Special requirements for carbon dioxide, refrigerated liquid and nitrous oxide, refrigerated liquid.* Each tank car must have an insulation system so that the thermal conductance is not more than 0.613 kilojoules per hour, per square meter, per degree Celsius (0.03 B.t.u. per square foot per hour, per degree Fahrenheit) temperature differential. Each tank car must be equipped with one safety relief valve set to open at a pressure not exceeding 75 percent of the tank test pressure and one frangible disc design to burst at a pressure less than the tank test pressure. The discharge capacity of each safety relief device must be sufficient to prevent building up of pressure in the tank in excess of 82.5 percent of the test pressure of the tank. Tanks must be equipped with two regulating valves set to open at a pressure not to exceed 24.1 Bar (350 psi) on DOT 105A500W tanks and at a pressure not to exceed 27.6 Bar (400 psi) on DOT 105A600W tanks. Each regulating valve and safety relief device must have its final discharge piped to the outside of the protective housing.

9. In § 173.319, new paragraph (e) is added to read as follows:

§ 173.319 Cryogenic liquids in tank cars.

* * * * *

(e) *Special requirements for class DOT 113 tank cars.* (1) A class DOT–113 tank car need not be periodically pressure tested; however, each shipment must be monitored to determine the average daily pressure rise in the tank car. If the average daily pressure rise during any shipment exceeds 0.2 Bar (3 psi) per day, the tank must be tested for thermal integrity prior to any subsequent shipment.

(2) *Thermal integrity test.* When required by paragraph (e)(1) of this section, either of the following thermal integrity tests may be used:

(i) *Pressure rise test.* The pressure rise in the tank may not exceed 0.34 Bar (5 psi) in 24 hours. When the pressure rise test is performed, the absolute pressure in the annular space of the loaded tank car may not exceed 75 microns of

mercury at the beginning of the test and may not increase more than 25 microns during the 24-hour period; or

(ii) *Calculated heat transfer rate test.* The insulation system must be performance tested as prescribed in § 179.400–4 of this subchapter. When the calculated heat transfer rate test is performed, the absolute pressure in the annular space of the loaded tank car may not exceed 75 microns of mercury at the beginning of the test and may not increase more than 25 microns during the 24-hour period. The calculated heat transfer rate in 24 hours may not exceed:

(A) 120 percent of the appropriate standard heat transfer rate specified in § 179.401–1 of this subchapter, for DOT–113A60W and DOT–113C120W tank cars;

(B) 122.808 joules (0.1164 Btu/day/lb.) of inner tank car water capacity, for DOT–113A175W tank cars;

(C) 345.215 joules (0.3272 Btu/day/lb.) of inner tank car water capacity, for DOT–113C60W and 113D60W tank cars; or

(D) 500.09 joules (0.4740 Btu/day/lb.) of inner tank car water capacity, for DOT–113D120W tank cars.

(3) A tank car that fails a test prescribed in paragraph (e)(2) of this section must be removed from hazardous materials service. A tank car removed from hazardous materials service because it failed a test prescribed in paragraph (e)(2) of this section may not be used to transport a hazardous material unless the tank car conforms to all applicable requirements of this subchapter.

(4) Each frangible disc must be replaced with a new frangible disc every 12 months, and the replacement date must be marked on the car near the pressure relief valve information.

(5) Pressure relief valves and alternate pressure relief valves must be tested every five years. The start-to-discharge pressure and vapor tight pressure requirements for the pressure relief valves must be as specified in § 179.401–1 of this subchapter. The alternate pressure relief device values specified in § 179.401–1 of this subchapter for a DOT–113C120W tank car apply to a DOT–113D120W tank car.

§ 173.319 [Amended]

10. In addition, in § 173.319, in paragraph (a)(4)(iii), the parenthetical reference ''(see § 173.31(c)(13))'' is removed.

11. In § 173.323, paragraph (c)(1) is revised to read as follows:

§ 173.323 Ethylene oxide.

* * * * *

(c) * * *

(1) *Tank cars.* Class DOT 105J tank cars: Notwithstanding the requirements of § 173.31(c), each tank car must have a tank test pressure of at least 20.7 Bar (300 psi) no later than July 1, 2006.

* * * * *

PART 179—SPECIFICATIONS FOR TANK CARS

2. The authority citation for part 179 continues to read as follows:

Authority: 49 App. U.S.C. 5101–5127; 49 CFR 1.53.

§ 179.1 [Amended]

13. In § 179.1, in paragraph (c), the section reference ''§ 173.31'' is revised to read ''§ 180.507''.

14. In § 179.2, paragraph (a)(10) is redesignated as paragraph (a)(11) and a new paragraph (a)(10) is added to read as follows:

§ 179.2 Definitions and abbreviations.

(a) * * *

(10) *Tank car facility* means an entity that manufactures, repairs, inspects, or tests a tank car to ensure that the tank car conforms to this part and subpart F of part 180 of this subchapter, that alters the certificate of construction of the tank car, that ensures the continuing qualification of a tank car by performing a function prescribed in parts 179 or 180 of this subchapter, or that makes any representation indicating compliance with one or more of the requirements of parts 179 or 180 of this subchapter.

* * * * *

15. Section 179.7 is added to subpart A to read as follows:

§ 179.7 Quality assurance program.

(a) At a minimum, each tank car facility shall have a quality assurance program, approved by AAR, that—

(1) Ensures the finished product conforms to the requirements of the applicable specification and regulations of this subchapter;

(2) Has the means to detect any nonconformity in the manufacturing, repair, or testing of the tank car; and

(3) Prevents non-conformities from recurring.

(b) At a minimum, the quality assurance program must have the following elements—

(1) Statement of authority and responsibility for those persons in charge of the quality assurance program.

(2) An organizational chart showing the interrelationship between managers, engineers, purchasing, construction, inspection, testing, and quality control personnel.

(3) Procedures to ensure that the latest applicable drawings, design calculations, specifications, and instructions are used in manufacture, inspection, testing, and repair.

(4) Procedures to ensure that the fabrication and construction materials received are properly identified and documented.

(5) A description of the manufacturing, inspection, and testing program so that an inspector can determine specific inspection and test intervals.

(6) Monitoring and control of processes and product characteristics during production.

(7) Procedures for correction of imperfections.

(8) Provisions indicating that the requirements of the AAR Specifications for Tank Cars, Specification M–1002, apply.

(9) Qualification requirements of personnel performing ultrasonic, radiographic, dye penetrant, magnetic particle, or other non-destructive inspections and tests.

(10) Qualification requirements of personnel performing optically aided visual inspections (including fiber optic, borescope, and video-image-scope systems). Under these requirements, the examiner must have the capability to consistently and repetitively find flaws under test conditions. Furthermore, the requirements must include visual acuity criteria where detectability (minimum size of a flaw that an examiner can find); resolution (minimum distance at which two flaws may be seen separately); and contrast sensitivity (minimum detectable thickness change (convolutions) over a surface area) further define the qualifications of the examiner.

(11) Procedures for evaluating the inspection and test technique employed, including the accessibility of the area and the sensitivity of the inspection and test technique and minimum detectable crack length.

(12) Procedures for the periodic calibration and measurement of inspection and test equipment.

(13) A system for the maintenance of records, inspections, tests, and the interpretation of inspection and test results.

(c) Each tank car facility shall ensure that only personnel qualified for each non-destructive inspection and test perform that particular operation.

(d) Each tank car facility shall establish written procedures for their employees to ensure that the work performed on the tank car conforms to the specification and AAR approval for the tank car.

(e) Each tank car facility shall train its employees in accordance with Subpart

H of part 172 of this subchapter on the program and procedures specified in paragraph (b) of this section to ensure quality.

(f) *Date of conformance.* After July 1, 1998, no tank car facility may manufacture, repair, inspect, or test tank cars subject to requirements of this subchapter, unless it is operating in conformance with a quality assurance program and written procedures required by paragraphs (a) and (b) of this section.

16. Section 179.16 is added to subpart B to read as follows:

§ 179.16 Tank-head puncture-resistance systems.

(a) *Performance standard.* When the regulations in this subchapter require a tank-head puncture-resistance system, the system shall be capable of sustaining, without any loss of lading, coupler-to-tank-head impacts at relative car speeds of 29 km/hour (18 mph) when:

(1) The weight of the impact car is at least 119,295 kg (263,000 pounds);

(2) The impacted tank car is coupled to one or more backup cars that have a total weight of at least 217,724 kg (480,000 pounds) and the hand brake is applied on the last ''backup'' car; and

(3) The impacted tank car is pressurized to at least 6.9 Bar (100 psi).

(b) Compliance with the requirements of paragraph (a) of this section shall be verified by full-scale testing according to Appendix A of this part or by installing full-head protection (shields) or full tank-head jackets on each end of the tank car conforming to the following—

(1) The tank-head puncture-resistance system must be at least 1.27 cm (0.5 inch) thick, shaped to the contour of the tank head and made from steel having a tensile strength greater than 379.21 N/mm^2 (55,000 psi).

(2) The design and test requirements of the tank-head puncture-resistance system must meet the impact test requirements of Section 5.3 of the AAR Specifications for Tank Cars.

(3) The workmanship must meet the requirements of Section C, Part II, Chapter 5 of the AAR Specifications for Design, Fabrication, and Construction of Freight Cars.

17. Section 179.18 is added to subpart B to read as follows:

§ 179.18 Thermal protection systems.

(a) *Performance standard.* When the regulations in this subchapter require thermal protection on a tank car, the tank car must have sufficient thermal resistance so that there will be no release of any lading within the tank car, except release through the safety relief valve, when subjected to:

(1) A pool fire for 100 minutes; and

(2) A torch fire for 30 minutes.

(b) *Thermal analysis.* (1) Compliance with the requirements of paragraph (a) of this section shall be verified by modeling the fire effects on the entire surface of the tank car according to the procedures outlined in *''Temperatures, Pressures and Liquid Levels of Tank Cars Engulfed in Fires,'' DOT/FRA/OR&D–84/08.11, (1984), Federal Railroad Administration, Washington D.C.* (available from National Technical Information Service, Springfield, VA 22161), or other procedure approved by the AAR Committee on Tank Cars. The analysis must also consider the fire effects on and the heat flux through tank discontinuities, protective housings, underframes, metal jackets, insulation, and thermal protection. A complete record of each analysis shall be made, retained and, upon request, made available for inspection and copying by an authorized representative of the Department.

(2) When the analysis shows the thermal resistance of the tank car does not conform to paragraph (a) of this section, the thermal resistance of the tank car must be increased by using a system listed by the Department under paragraph (c) of this section or by testing an unlisted system and verifying it according to appendix B of this part.

(c) *Systems that no longer require test verification.* The Department maintains a list of thermal protection systems that comply with the requirements of appendix B of this part and that no longer require test verification. Information necessary to equip tank cars with one of these systems is available in the Dockets Unit, Research and Special Programs Administration, 400 Seventh Street, SW., Washington, D.C. 20590–0001.

18. Section 179.20 is added to subpart B to read as follows:

§ 179.20 Service equipment; protection systems.

If an applicable tank car specification authorizes location of filling or discharge connections in the bottom shell, the connections must be designed, constructed, and protected according to paragraphs E9.00 and E10.00 of the AAR Specifications for Tank Cars, M–1002.

19. Section 179.22 is added to subpart B to read as follows:

§ 179.22 Marking.

In addition to any other marking requirement in this subchapter, the following marking requirements apply:

(a) Each tank car must be marked according to the requirements in Appendix C of the AAR Specifications for Tank Cars.

(b) Each tank car that is equipped with a tank-head puncture-resistance system must have the letter ''S'' substituted for the letter ''A'' in the specification marking.

(c) Each tank car that is equipped with a tank-head puncture-resistance system, a thermal protection system, and a metal jacket must have the letter ''J'' substituted for the letter ''A'' or ''S'' in the specification marking.

(d) Each tank car that is equipped with a tank-head puncture-resistance system, a thermal protection system, and no metal jacket must have the letter ''T'' substituted for the letter ''A'' or ''S'' in the specification marking.

§ 179.100–4 [Amended]

20. In § 179.100–4, in paragraph (a), the last sentence is amended by removing the phrase ''except that a protective coating is not required when foam-in-place insulation that adheres to the tank or jacket is applied''.

§§ 179.100–21 and 179.100–23 [Removed]

21. Sections 179.100–21 and 179.100–23 are removed.

22. In § 179.101–1, in paragraph (a), Note 4 following the table is revised to read as follows:

§ 179.101–1 Individual specification requirements.

(a) * * *

[4] Tank cars not equipped with a thermal protection or an insulation system used for the transportation of a Class 2 (compressed gas) material must have at least the upper two-thirds of the exterior of the tank, including manway nozzle and all appurtenances in contact with this area, finished with a reflective coat of white paint.

* * * * *

§ 179.103–1 [Amended]

23. In § 179.103–1, paragraph (c) is removed and reserved.

24. In § 179.103–2, paragraph (a) is revised to read as follows:

§ 179.103–2 Manway cover.

(a) The manway cover must be an approved design.

* * * * *

§ 179.103–5 [Amended]

25. In § 179.103–5, paragraph (a)(1) is amended by removing the first two sentences.

§§ 179.105, 179.105–1—179.105–8 [Removed]

26. Sections 179.105, 179.105–1 through 179.105–8 are removed.

27. In § 179.200–4, in paragraph (a), the last sentence is revised to read as follows:

§ 179.200–4 Insulation.

(a) * * * The exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket must be given a protection coating.

* * * * *

§§ 179.200–25 and 179.200–27 [Removed]

28. Sections 179.200–25 and 179.200–27 are removed.

§§ 179.203, 179.203–1—179.203–3 [Removed]

29. Sections 179.203, 179.203–1 through 179.203–2 are removed.

30. Appendixes A and B are added to Part 179 to read as follows:

Appendix A to Part 179—Procedures for Tank-Head Puncture-Resistance Test

1. This test procedure is designed to verify the integrity of new or untried tank-head puncture-resistance systems and to test for system survivability after coupler-to-tank-head impacts at relative speeds of 29 km/hour (18 mph).

2. *Tank-head puncture-resistance test.* A tank-head puncture-resistance system must be tested under the following conditions:

a. The ram car used must weigh at least 119,295 kg (263,000 pounds), be equipped with a coupler, and duplicate the condition of a conventional draft sill including the draft yoke and draft gear. The coupler must protrude from the end of the ram car so that it is the leading location of perpendicular contact with the impacted test car.

b. The impacted test car must be loaded with water at six percent outage with internal pressure of at least 6.9 Bar (100 psi) and coupled to one or more ''backup'' cars which have a total weight of 217,724 kg (480,000 pounds) with hand brakes applied on the last ''backup'' car.

c. At least two separate tests must be conducted with the coupler on the vertical centerline of the ram car. One test must be conducted with the coupler at a height of 53.3 cm (21 inches), plus-or-minus 2.5 cm (1 inch), above the top of the sill; the other test must be conducted with the coupler height at 79 cm (31 inches), plus-or-minus 2.5 cm (1 inch), above the top of the sill. If the combined thickness of the tank head and any additional shielding material is less than the combined thickness on the vertical centerline of the car, a third test must be conducted with the coupler positioned so as to strike the thinnest point of the tank head.

3. One of the following test conditions must be applied:

Minimum weight of attached ram cars in kg (pounds)	Minimum velocity of impact in km/hour (mph)	Restrictions
119,295 (263,000).	29 (18)	One ram car only.
155,582 (343,000).	25.5 (16) ..	One ram car or one car plus one rigidly attached car.
311,164 (686,000).	22.5 (14) ..	One ram car plus one or more rigidly attached cars.

4. A test is successful if there is no visible leak from the standing tank car for at least one hour after impact.

Appendix B to Part 179—Procedures for Simulated Pool and Torch-Fire Testing

1. This test procedure is designed to measure the thermal effects of new or untried thermal protection systems and to test for system survivability when exposed to a 100-minute pool fire and a 30-minute torch fire.

2. *Simulated pool fire test.*

a. A pool-fire environment must be simulated in the following manner:

(1) The source of the simulated pool fire must be hydrocarbon fuel with a flame temperature of 871 °C (1,600 °F), plus-or-minus 37.8 °C (100 °F), throughout the duration of the test.

(2) A square bare plate with thermal properties equivalent to the material of construction of the tank car must be used. The plate dimensions must be not less than one foot by one foot by nominal 1.6 cm (0.625 inch) thick. The bare plate must be instrumented with not less than nine thermocouples to record the thermal response of the bare plate. The thermocouples must be attached to the surface not exposed to the simulated pool fire and must be divided into nine equal squares with a thermocouple placed in the center of each square.

(3) The pool-fire simulator must be constructed in a manner that results in total flame engulfment of the front surface of the bare plate. The apex of the flame must be directed at the center of the plate.

(4) The bare plate holder must be constructed in such a manner that the only heat transfer to the back side of the bare plate is by heat conduction through the plate and not by other heat paths.

(5) Before the bare plate is exposed to the simulated pool fire, none of the temperature recording devices may indicate a plate temperature in excess of 37.8 °C (100 °F) nor less than 0 °C (32 °F).

(6) A minimum of two thermocouple devices must indicate 427 °C (800 °F) after 13 minutes, plus-or-minus one minute, of simulated pool-fire exposure.

b. A thermal protection system must be tested in the simulated pool-fire environment described in paragraph 2a of this appendix in the following manner:

(1) The thermal protection system must cover one side of a bare plate as described in paragraph 2a(2) of this appendix.

(2) The non-protected side of the bare plate must be instrumented with not less than nine thermocouples placed as described in paragraph 2a(2) of this appendix to record the thermal response of the plate.

(3) Before exposure to the pool-fire simulation, none of the thermocouples on the thermal protection system configuration may indicate a plate temperature in excess of 37.8 °C (100 °F) nor less than 0 °C (32 °F).

(4) The entire surface of the thermal protection system must be exposed to the simulated pool fire.

(5) A pool-fire simulation test must run for a minimum of 100 minutes. The thermal protection system must retard the heat flow to the plate so that none of the thermocouples on the non-protected side of the plate indicate a plate temperature in excess of 427 °C (800 °F).

(6) A minimum of three consecutive successful simulation fire tests must be performed for each thermal protection system.

3. *Simulated torch fire test.*

a. A torch-fire environment must be simulated in the following manner:

(1) The source of the simulated torch must be a hydrocarbon fuel with a flame temperature of 1,204 °C (2,200 °F), plus-or-minus 37.8 °C (100 °F), throughout the duration of the test. Furthermore, torch velocities must be 64.4 km/h ± 16 km/h (40 mph ± 10 mph) throughout the duration of the test.

(2) A square bare plate with thermal properties equivalent to the material of construction of the tank car must be used. The plate dimensions must be at least four feet by four feet by nominal 1.6 cm (0.625 inch) thick. The bare plate must be instrumented with not less than nine thermocouples to record the thermal response of the plate. The thermocouples must be attached to the surface not exposed to the simulated torch and must be divided into nine equal squares with a thermocouple placed in the center of each square.

(3) The bare plate holder must be constructed in such a manner that the only heat transfer to the back side of the plate is by heat conduction through the plate and not by other heat paths. The apex of the flame must be directed at the center of the plate.

(4) Before exposure to the simulated torch, none of the temperature recording devices may indicate a plate temperature in excess of 37.8 °C (100 °F) or less than 0 °C (32 °F).

(5) A minimum of two thermocouples must indicate 427 °C (800 °F) in four minutes, plus-or-minus 30 seconds, of torch simulation exposure.

b. A thermal protection system must be tested in the simulated torch-fire environment described in paragraph 3a of this appendix in the following manner:

(1) The thermal protection system must cover one side of the bare plate identical to that used to simulate a torch fire under paragraph 3a(2) of this appendix.

(2) The back of the bare plate must be instrumented with not less than nine thermocouples placed as described in

paragraph 3a(2) of this appendix to record the thermal response of the material.

(3) Before exposure to the simulated torch, none of the thermocouples on the back side of the thermal protection system configuration may indicate a plate temperature in excess of 37.8 °C (100 °F) nor less than 0 °C (32 °F).

(4) The entire outside surface of the thermal protection system must be exposed to the simulated torch-fire environment.

(5) A torch-simulation test must be run for a minimum of 30 minutes. The thermal protection system must retard the heat flow to the plate so that none of the thermocouples on the backside of the bare plate indicate a plate temperature in excess of 427 °C (800 °F).

(6) A minimum of two consecutive successful torch-simulation tests must be performed for each thermal protection system.

PART 180—CONTINUING QUALIFICATION AND MAINTENANCE OF PACKAGINGS

31. The authority citation for part 180 continues to read as follows:

Authority: 49 U.S.C. 5101–5127; 49 CFR 1.53.

32. A new Subpart F is added to part 180 to read as follows:

Subpart F—Qualification and Maintenance of Tank Cars

Sec.

Subpart F—Qualification and Maintenance of Tank Cars

§ 180.501 Applicability.

(a) This subpart prescribes requirements, in addition to those contained in parts 107, 171, 172, 173, and 179 of this subchapter, applicable to any person who manufactures, fabricates, marks, maintains, repairs, inspects, or services tank cars to ensure that the tank cars are in proper condition for transportation.

(b) Any person who performs a function prescribed in this part shall perform that function in accordance with this part.

§ 180.503 Definitions.

The definitions contained in §§ 171.8 and 179.2 of this subchapter apply.

§ 180.505 Quality assurance program.

The quality assurance program requirements of § 179.7 of this subchapter apply.

§ 180.507 Qualification of tank cars.

(a) Each tank car marked as meeting a ''DOT'' specification or any other tank car used for the transportation of a hazardous material must meet the requirements of this subchapter or the applicable specification to which the tank was constructed.

(b) *Tank car specifications no longer authorized for construction.* (1) Tank cars prescribed in the following table are authorized for service provided they conform to all applicable safety requirements of this subchapter:

Specification prescribed in the current regulations	Other specifications permitted	Notes
105A200W	105A100W	1
105A200ALW	105A100ALW	1
105A300W	ICC–105, 105A300.	
105A400W	105A400.	
105A500W	105A500.	
105A600W	105A600.	
106A500X	ICC–27, BE–27, 106A500.	
106A800X	106A800.	
107A * * * *	.....	2

Note 1: Tanks built as Specification DOT 105A100W or DOT 105A100ALW may be altered and converted to DOT 105A200W and DOT 105A200ALW, respectively.

Note 2: The test pressures of tanks built in the United States between January 1, 1941 and December 31, 1955, may be increased to conform to Specification 107A. Original and revised test pressure markings must be indicated and may be shown on the tank or on a plate attached to the bulkhead of the car. Tanks built before 1941 are not authorized.

(2) For each tank car conforming to and used under an exemption issued before October 1, 1984, which authorized the transportation of a cryogenic liquid in a tank car, the owner or operator shall remove the exemption number stenciled on the tank car and stamp the tank car with the appropriate Class DOT–113 specification followed by the applicable exemption number. For example: DOT–113D60W–E * * * * (asterisks to be replaced by the exemption number). The owner or operator marking a tank car in this manner shall retain on file a copy of the last exemption in effect during the period the tank car is in service. No person may modify a tank car marked under this paragraph unless the modification is in compliance with an applicable requirement or provision of this subchapter.

(3) Specification DOT–113A175W, DOT–113C60W, DOT–113D60W, and DOT–113D120W tank cars may continue in use, but new construction is not authorized.

(4) Class DOT 105A and 105S tank cars used to transport hydrogen chloride, refrigerated liquid under the terms of DOT–E 3992 may continue in service, but new construction is not authorized.

§ 180.509 Requirements for inspection and test of specification tank cars.

(a) *General.* (1) Each tank car facility shall evaluate a tank car according to the requirements specified in § 180.511.

(2) Each tank car that successfully passes a periodic inspection and test must be marked as prescribed in § 180.515.

(3) A written report as specified in § 180.517(b) must be prepared for each tank car that is inspected and tested under this section.

(b) *Conditions requiring inspection and test of tank cars.* Without regard to any other periodic inspection and test requirement, a tank car must have an inspection and test according to this section if:

(1) The tank car shows evidence of abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other condition that makes the tank car unsafe for transportation.

(2) The tank car was in an accident and damaged to an extent that may adversely affect its capability to retain its contents.

(3) The tank bears evidence of damage caused by fire.

(4) The Associate Administrator for Safety, FRA, requires it based on the existence of probable cause that a tank car or a class or design of tank cars may be in an unsafe operating condition.

(c) *Frequency of inspection and tests.* Each tank car shall have an inspection and test according to the requirements of this paragraph.

(1) For Class 107 tank cars and tank cars of riveted construction, the tank car must have a hydrostatic pressure test and visual inspection conforming to the requirements in effect prior to July 1, 1996, for the tank specification.

(2) For Class DOT 113 tank cars, see § 173.319(e) of this subchapter.

(3) For fusion welded tank cars, each tank car must have an inspection and test in accordance with paragraphs (d) through (k) of this section.

(i) For cars transporting materials not corrosive to the tank, every 10 years for the tank and service equipment (i.e., filling and discharge, venting, safety, heating, and measuring devices).

(ii) For non-lined or non-coated tank cars transporting materials corrosive to the tank, an interval based on the following formula, but in no case shall

the interval exceed 10 years for the tank and 5 years for service equipment:

$$i = \frac{t_1 - t_2}{r}$$

where:
i is the inspection and test interval.
t_1 is the actual thickness.
t_2 is the allowable minimum thickness under paragraph (g) of this section.
r is the corrosion rate per year.

(iii) For lined or coated tank cars transporting a material corrosive to the tank, every 10 years for the tank, 5 years for the service equipment, and when a lining or coating is applied to protect the tank shell from the lading, an interval based on the owner's determination for the lining or coating, but not greater than every 10 years.

(A) When a lining or coating is applied to protect the tank shell from the lading, each owner of a lining or coating shall determine the periodic inspection interval and test technique for the lining or coating. The owner must maintain all supporting documentation used to make such a determination, such as the lining or coating manufacturer's recommended inspection interval and test technique, at the owner's principal place of business.

(B) The supporting documentation used to make such inspection and test interval determinations and technique must be made available to FRA upon request.

(d) *Visual inspection.* At a minimum, each tank car facility must visually inspect the tank externally and internally as follows:

(1) An internal inspection of the tank shell and heads for abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other condition that makes the tank car unsafe for transportation, and except in the areas where insulation or a thermal protection system precludes it, an external inspection of the tank shell and heads for abrasion, corrosion, cracks, dents, distortions, defects in welds, or any other condition that makes the tank car unsafe for transportation;

(2) An inspection of the piping, valves, fittings, and gaskets for indications of corrosion and other conditions that make the tank car unsafe for transportation;

(3) An inspection for missing or loose bolts, nuts, or elements that make the tank car unsafe for transportation;

(4) An inspection of all closures on the tank car for proper securement in a tool tight condition and an inspection of the protective housings for proper securement;

(5) An inspection of excess flow valves having threaded seats for tightness; and

(6) An inspection of the required markings on the tank car for legibility.

(e) *Structural integrity inspections and tests.* At a minimum, each tank car facility shall inspect the tank car for structural integrity as specified in this section. The structural integrity inspection and test shall include all transverse fillet welds greater than 0.64 cm (0.25 inch) within 121.92 cm (4 feet) of the bottom longitudinal center line; the termination of longitudinal fillet welds greater than 0.64 cm (0.25 inch) within 121.92 cm (4 feet) of the bottom longitudinal center line; and all tank shell butt welds within 60.96 cm (2 feet) of the bottom longitudinal center line by one or more of the following inspection and test methods to determine that the welds are in proper condition:

(1) Dye penetrant test;

(2) Radiography test;

(3) Magnetic particle test;

(4) Ultrasonic test; or

(5) Optically-aided visual inspection (e.g., magnifiers, fiberscopes, borescopes, and machine vision technology).

(f) *Thickness tests.* (1) Each tank car facility shall measure the thickness of the tank car shell, heads, sumps, domes, and nozzles on each tank car by using a device capable of accurately measuring the thickness to within ±0.05 mm (±0.002 inch).

(2) After repairs, alterations, conversions or modifications of a tank car that result in a reduction to the tank car shell thickness, the tank car facility shall measure the thickness of the tank car shell in the area of reduced shell thickness to ensure that the shell thickness conforms to paragraph (g) of this section.

(g) *Service life shell thickness allowance.* (1) A tank car found with a shell thickness below the required minimum thickness after forming for its specification, as stated in part 179 of this subchapter, may continue in service if:

(i) Construction of the tank car shell and heads is from carbon steel, stainless steel, aluminum, nickel, or manganese-molybdenum steel; and

(ii) Any reduction in thickness of the tank shell or head is not more than that provided in the following table:

ALLOWABLE SHELL THICKNESS REDUCTIONS

Damage type	Class DOT 103, 104, 111, and 115 tank cars		Class DOT 105, 109, 112, and 114 tank cars	
	Top shell	Bottom shell	Top shell	Bottom shell
Corrosion	3.17 mm (0.125 inch)	1.58 mm (0.063 inch)	0.79 mm (0.031 inch)	0.79 mm (0.031 inch).
Corrosion and mechanical	3.17 mm (0.125 inch)	1.58 mm (0.063 inch)	0.79 mm (0.031 inch)	0.79 mm (0.031 inch).
Corrosion, local	4.76 mm (3/16 inch)	3.17 mm (0.125 inch)	1.58 mm (0.063 inch)	1.58 mm (0.063 inch).
Mechanical, local	3.17 mm (0.125 inch)	1.58 mm (0.063 inch)	1.58 mm (0.063 inch)	1.58 mm (0.063 inch).
Corrosion and mechanical, local.	4.76 mm (3/16 inch)	3.17 mm (0.125 inch)	1.58 mm (0.063 inch)	1.58 mm (0.063 inch).

Notes:
1. The perimeter for a local reduction may not exceed a 60.96 cm (24 inch) perimeter. Local reductions in the top shell must be separated from other reductions in the top shell by at least 40.64 cm (16 inches). The cumulative perimeter for local reductions in the bottom shell may not exceed 182.88 cm (72 inches).
2. Any reduction in the tank car shell may not affect the structural strength of the tank car so that the tank car shell no longer conforms to Section 6.2 of the AAR Specifications for Tank Cars.
3. Any reduction applies only to the outer shell for Class DOT 115 tank cars.
4. For Class DOT 103 and 104 tank cars, the inside diameter may not exceed 243.84 cm (96 inches).

(h) *Safety system inspections.* At a minimum, each tank car facility must inspect:

(1) Tank car thermal protection systems, tank head puncture resistance systems, coupler vertical restraint systems, and systems used to protect discontinuities (i.e., skid protection and protective housings) to ensure their integrity.

(2) Reclosing pressure relief devices by:

(i) Removing the safety relief device from the tank car for inspection; and

(ii) Testing the safety relief device with air or another gas to ensure that it conforms to the start-to-discharge pressure for the specification or hazardous material in this subchapter.

(i) *Lining and coating inspection and test.* When this subchapter requires a lining or coating, at a minimum, each tank car facility must inspect the lining or coating installed on the tank car according to the inspection interval and test technique established by the owner of the lining or coating in accordance with paragraph (c)(3)(iii) of this section.

(j) *Leakage pressure test.* (1) At a minimum, each tank car facility shall perform a leakage pressure test on the tank fittings and appurtenances. The leakage pressure test must include product piping with all valves and accessories in place and operative, except that during the pressure test the tank car facility shall remove or render inoperative any venting devices set to discharge at less than the test pressure. Test pressure must be maintained for at least 5 minutes. Leakage test pressure may not be less than 2.1 Bar (30 psig) for tank cars having a test pressure less than or equal to 13.8 Bar (200 psig), or 3.4 Bar (50 psig) for tank cars having a tank test pressure greater than 13.8 Bar (200 psig).

(2) Interior heater systems must be tested hydrostatically at 13.87 Bar (200 psi) and must show no signs of leakage.

(k) *Alternative inspection and test procedures.* In lieu of the other requirements of this section, a person may use an alternative inspection and test procedure or interval based on a damage-tolerance fatigue evaluation (that includes a determination of the probable locations and modes of damage due to fatigue, corrosion, or accidental damage), when the evaluation is examined by the Association of American Railroads Tank Car Committee and approved by the Associate Administrator for Safety, FRA.

(l) *Inspection and test compliance date for tank cars with metal jackets or thermal protection systems.* (1) After July 1, 2000, each tank car with a metal jacket or with a thermal protection system shall have an inspection and test conforming to this section no later than the date the tank car requires a periodic hydrostatic pressure test (i.e., the marked due date on the tank car for the hydrostatic test).

(2) After July 1, 1998, each tank car without a metal jacket shall have an inspection and test conforming to this section no later than the date the tank car requires a periodic hydrostatic pressure test (i.e., the marked due date on the tank car for the hydrostatic test).

(3) For tank cars on a 20-year periodic hydrostatic pressure test interval (i.e., Class DOT 103W, 104W, 111A60W1, 111A100W1, and 111A100W3 tank cars), the next inspection and test date is the midpoint between the compliance date in paragraph (l)(1) or (2) of this section and the remaining years until the tank would have had a hydrostatic pressure test.

§ 180.511 Acceptable results of inspections and tests.

Provided it conforms with other applicable requirements of this subchapter, a tank car is qualified for use if it successfully passes the following inspections and tests conducted in accordance with this subpart:

(a) *Visual inspection.* A tank car successfully passes the visual inspection when the inspection shows no structural defect that may cause leakage from or failure of the tank before the next inspection and test interval.

(b) *Structural integrity inspection and test.* A tank car successfully passes the structural integrity inspection and test when it shows no structural defect that may initiate cracks or propagate cracks and cause failure of the tank before the next inspection and test interval.

(c) *Service life shell thickness.* A tank car successfully passes the service life shell thickness inspection when the tank shell and heads show no thickness reduction below that allowed in § 180.509(g).

(d) *Safety system inspection.* A tank car successfully passes the safety system inspection when each thermal protection system, tank head puncture resistance system, coupler vertical restraint system, and system used to protect discontinuities (e.g., breakage grooves on bottom outlets and protective housings) on the tank car conform to this subchapter.

(e) *Lining and coating inspection.* A tank car successfully passes the lining and coating inspection and test when the lining or coating shows no evidence of holes or degraded areas.

(f) *Leakage pressure test.* A tank car successfully passes the leakage pressure test when all product piping, fittings and closures show no indication of leakage.

(g) *Hydrostatic test.* A Class 107 tank car or a riveted tank car successfully passes the hydrostatic test when it shows no leakage, distortion, excessive permanent expansion, or other evidence of weakness that might render the tank car unsafe for transportation service.

§ 180.513 Repairs, alterations, conversions, and modifications.

(a) In order to repair tank cars, the tank car facility must comply with the requirements of Appendix R of the AAR Specifications for Tank Cars.

(b) Unless the exterior tank car shell or interior tank car jacket has a protective coating, after a repair that requires the complete removal of the tank car jacket, the exterior tank car shell and the interior tank car jacket must have a protective coating applied to prevent the deterioration of the tank shell and tank jacket.

§ 180.515 Markings.

(a) When a tank car passes the required inspection and test with acceptable results, the tank car facility shall mark the date of the inspection and test and the due date of the next inspection and test on the tank car in accordance with paragraph (b) of this section. When a tank car facility performs multiple inspection and test at the same time, one date may be used to satisfy the requirements of this section. One date also may be shown when multiple inspection and test have the same due date.

(b) The tank car facility must comply with the marking requirements of Appendix C of the AAR Specifications for Tank Cars.

(c) Converted tank cars must have the new specification and conversion date permanently marked in letters and figures at least 0.95 cm (0.375 inch) high on the outside of the manway nozzle or the edge of the manway nozzle flange on the left side of the car. The marking may have the last numeral of the specification number omitted (e.g., ''DOT 111A100W'' instead of ''DOT 111A100W1'').

(d) When pressure tested within six months of installation and protected from deterioration, the test date marking of a safety relief device is the installation date on the tank car.

§ 180.517 Reporting and record retention requirements.

(a) *Certification and representation.* Each owner of a specification tank car shall retain the certificate of construction (AAR Form 4–2) and related papers certifying that the manufacture of the specification tank car identified in the documents is in accordance with the applicable specification. The owner shall retain the documents throughout the period of ownership of the specification tank car and for one year thereafter. Upon a

change of ownership, the requirements of Section 1.3.15 of the AAR Specifications for Tank Cars apply.

(b) *Inspection and test reporting.* Each tank car that is inspected as specified in § 180.509 must have a written report, in English, prepared according to this paragraph. The owner must retain a copy of the inspection and test reports until successfully completing the next inspection and test of the same type. The inspection and test report must include the following:

(1) Type of inspection and test performed (a checklist is acceptable);

(2) The results of each inspection and test performed;

(3) Owner's reporting mark;

(4) DOT Specification;

(5) Inspection and test date (month and year);

(6) Location and description of defects found and method used to repair each defect;

(7) The name and address of the tank car facility and the signature of inspector.

§ 180.519 Periodic retest and inspection of tank cars other than single-unit tank car tanks.

(a) *General.* Unless otherwise provided in this subpart, tanks designed to be removed from cars for filling and emptying and tanks built to a Class DOT 107A specification and their safety relief devices must be retested periodically as specified in Retest Table 1 of paragraph (b)(5) of this section. Retests may be made at any time during the calendar year the retest falls due.

(b) *Pressure test.* (1) Each tank, except as provided in paragraph (b)(8) of this section, must be subjected to the specified hydrostatic pressure and its permanent expansion determined. Pressure must be maintained for 30 seconds and far as long as necessary to secure complete expansion of the tank. Before testing, the pressure gauge must be shown to be accurate within 1 percent at test measure. The expansion gauge must be shown to be accurate, at test pressure, to within 1 percent. Expansion must be recorded in cubic centimeters. Permanent volumetric expansion may not exceed 10 percent of total volumetric expansion at test pressure and the tank must not leak or show evidence of distress.

(2) Each tank, except tanks built to specification DOT 107A, must also be subjected to interior air pressure test of at least 100 psi under conditions favorable to detection of any leakage. No leaks may appear.

(3) Safety relief valves must be retested by air or gas, must start to discharge at or below the prescribed pressure and must be vapor tight at or above the prescribed pressure.

(4) Frangible discs and fusible plugs must be removed from the tank and visually inspected.

(5) Tanks must be retested as specified in Retest Table 1 of this paragraph (b)(5), and before returning to service after repairs involving welding or heat treatment:

RETEST TABLE 1

Specification	Retest interval—years		Minimum Retest pressure—p.s.i.		Safety relief valve pressure—p.s.i.	
	Tank	Safety relief devices [d]	Tank hydrostatic expansion [c]	Tank air test	Start-to-discharge	Vapor tight
DOT 27	5	2	500	100	375	300
106A500	5	2	500	100	375	300
106A500X	5	2	500	100	375	300
106A800	5	2	800	100	600	480
106A800X	5	2	800	100	600	480
106A800NCI	5	2	800	100	600	480
107A * * * *	[d]5	[a]2	([b])	None	None	None
110A500–W	5	2	500	100	375	300
110A600–W	5	2	600	100	500	360
110A800–W	5	2	800	100	600	480
110A1000–W	5	2	1,000	100	750	600
BE–275	5	2	500	100	375	300

Notes:

[a] If DOT 107A * * * * tanks are used for transportation of flammable gases, one frangible disc from each car must be burst at the interval prescribed. The sample disc must burst at a pressure not exceeding the marked test pressure of the tank and not less than 70 percent of the marked test pressure. If the sample disc does not burst within the prescribed limits, all discs on the car must be replaced.

[b] The hydrostatic expansion test pressure must at least equal the marked test pressure.

[c] See § 180.519(b)(1).

[d] Safety relief valves of the spring-loaded type on tanks used exclusively for fluorinated hydrocarbons and mixtures thereof which are free from corroding components may be retested every 5 years.

(6) The month and year of test, followed by a ''V'' if visually inspected as described in paragraph (d)(8) of this section, must be plainly and permanently stamped into the metal of one head or chime of each tank with successful test results; for example, 1–60 for January 1960. On DOT 107A**** tanks, the date must be stamped into the metal of the marked end, except that if all tanks mounted on a car have been tested, the date may be stamped into the metal of a plate permanently applied to the bulkhead on the ''A'' end of the car. Dates of previous tests and all prescribed markings must be kept legible.

(c) *Visual inspection.* Tanks of Class DOT 106A and DOT 110A–Z specifications (§§ 179.300, 179.301, 179.302 of this subchapter) used exclusively for transporting fluorinated hydrocarbons and mixtures thereof, and that are free from corroding components, may be given a periodic complete internal and external visual inspection in place of the periodic hydrostatic retest. Visual inspections shall be made only by competent persons. The tank must be accepted or rejected in accordance with the criteria in CGA Pamphlet C–6.

(d) *Written records.* The results of the pressure test and visual inspection must be recorded on a suitable data sheet. Completed copies of these reports must be retained by the owner and by the person performing the pressure test and visual inspection as long as the tank is in service. The information to be recorded and checked on these data

sheets are: Date of test and inspection; DOT specification number; tank identification (registered symbol and serial number, date of manufacture and ownership symbol); type of protective coating (painted, etc., and statement as to need for refinishing or recoating); conditions checked (leakage, corrosion, gouges, dents or digs, broken or damaged chime or protective ring, fire, fire damage, internal condition); test pressure; results of tests; and disposition of tank (returned to service, returned to manufacturer for repair, or scrapped); and identification of the person conducting the retest or inspection.

Issued in Washington, DC, on September 7, 1995 under authority delegated in 49 CFR Part 1.

D.K. Sharma,

Administrator.

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